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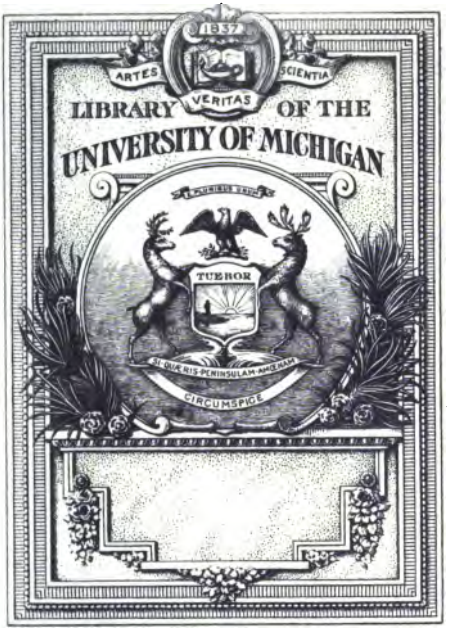
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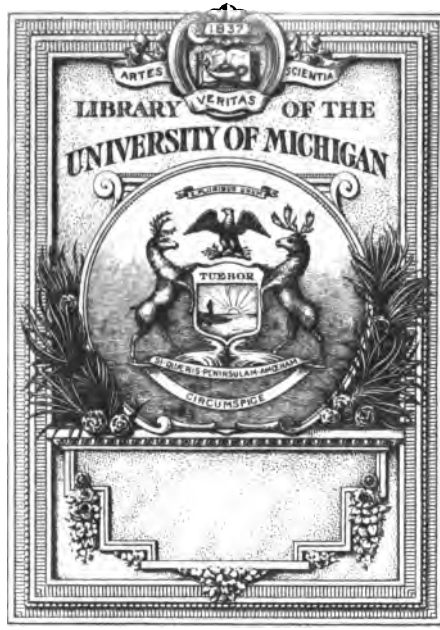
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ARTHUR H. CHEATLE, F.R.C.S.

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RULES AND REGULATIONS.

1. NAME OF THE SOCIETY.—The Society shall be called "The Otological Society of the United Kingdom."

2. OBJECTS OF THE SOCIETY.—The objects of the Society shall be

(*a*) The exhibition and demonstration of patients, models, drawings, and specimens (microscopical or otherwise), illustrating the Anatomy, Physiology, Pathology, and Therapeutics of the Ear.

(*b*) The reading of papers and the discussion of questions in Otology, previously approved by the Council.

(*c*) The investigation by Committees—

(i) Of matters of public importance relating to Otology.

(ii) New methods of investigation or treatment of the diseases of the ear.

3. CONSTITUTION OF THE SOCIETY.—The Society shall consist of Ordinary and Honorary Members.

The Officers of the Society shall be elected from among the Ordinary Members, and shall consist of a President, not less than two, and not more than four, Vice-Presidents, a Treasurer, a Librarian, an Editor of the *Transactions* and two Secretaries, who, with six other Members, shall constitute the Council. At least one-fourth of the Council shall consist of Members not resident in London.

4. ELECTION OF MEMBERS.—Candidates shall be proposed on a form provided for the purpose, and signed by at least three Members from personal knowledge, who shall state the grounds of their recommendation, which shall be, either

(*a*) Contributions to Otology.
(*b*) The charge of an Aural Clinic approved by the Council.
(*c*) Professional eminence.

The names of those proposed as new Members shall, in the first instance, be submitted to the Council, with whom the power shall rest of declining to allow the nomination to proceed.

The proposal paper shall be read at one ordinary meeting, and the ballot shall be taken at the next meeting.

No election shall take place unless ten Members vote; one black ball in five shall exclude.

5. FORM OF ADMISSION BY THE CHAIRMAN.—Members shall be admitted personally by the following form, after signing their names in the admission book, and thereby agreeing to abide by the rules of the Society, and paying their admission fee and first annual subscription.

Form of Admission.—"By the Authority and in the name of the Otological Society of the United Kingdom, I admit you a Member thereof."

6. HONORARY MEMBERS.—The Council shall have the power of electing men of distinguished eminence in Otology as Honorary Members. The number of Honorary Members shall not exceed six.

7. EXPULSION OF MEMBERS.—The Council shall have the power of expelling from the Society any Member whose conduct or mode of practice is considered unworthy of the Society. Notice of the Council's intention to expel him shall be sent in writing to the address in the Society's books, and he may appeal to the Society, whose vote, under Rule 8, shall be final.

8. APPEAL.—A Member who appeals against the decision of the Council, under Rule 7, can be finally expelled only at a General Meeting especially called for that purpose, and of which a written notice shall have been sent to every Member at least fourteen days previously. At least twenty votes must be accorded, and four-fifths shall carry the expulsion.

9. SUBSCRIPTIONS.—There shall be an Admission Fee of One Guinea.

The Annual Subscription shall be One Guinea, payable to the Treasurer in advance at the date of the Annual General Meeting. Any Member whose subscription is six months in arrear shall be reminded of the same by the Treasurer, and if it be not paid within the current year he shall again be reminded by the Treasurer, and if he fail to pay his subscription, his name may be removed by the Council from the list of Members.

10. THE ELECTION OF OFFICERS AND COUNCIL.—(*a*) All the Ordinary Members shall be summoned by letter to the Annual Meeting in December, notice being given a fortnight beforehand, and the hour of meeting being stated.

(*b*) The President, Vice-Presidents, Treasurer, Librarian, Editor, Secretaries, and Council shall be elected by ballot at each Annual Meeting, and shall commence their duties on the day following election.

(*c*) One-third of the Ordinary Members of the Council shall be replaced in rotation at each Annual Meeting by an equal number of Ordinary Members chosen from the Society at large.

(*d*) Balloting lists of the Members recommended by the Council to fill the vacant offices shall be prepared by the Secretaries, and forwarded, together with the summons to the Annual Meeting, to every Ordinary Member of the Society.

(*e*) Two Scrutineers, appointed by the President at the commencement of the Annual Meeting, shall receive the balloting lists during the first hour, at the end of which they shall report the result to the meeting.

(*f*) In the event of equality of suffrage the President shall determine by lot.

(*g*) If a Member wishes to propose for ballot any candidate for office other than those whose names stand upon the list recommended by the Council, the name of such candidate, duly proposed by one Member and seconded by two other Members, shall be sent to the Senior Secretary at least a week before the Annual General Meeting.

(*h*) The Council shall have the power of filling up any vacancies which may occur in any of the offices of the Society between one Annual Meeting and another.

11. THE PRESIDENT AND VICE-PRESIDENTS.—The President shall regulate all the proceedings of the Society and Council, state and put questions, interpret the application of the rules and regulations, and decide every doubtful point. He shall sign the minutes of General and Council Meetings.

In the absence of the President, one of the Vice-Presidents, Treasurer, or some Member chosen by the meeting, shall perform his duties. The President and Vice-Presidents shall not serve for more than two consecutive years.

Every third President shall, if practicable, be resident out of London.

12. THE SECRETARIES.—There shall be a Senior and a Junior Secretary elected for each session. The Senior shall retire at the end of each session, and shall, if the Society approve, be succeeded by the Junior. The Secretaries shall have the management of the correspondence of the Society and Council. They shall attend meetings. They shall take minutes, which they shall read at the following meeting. They shall notify to new Members their election. They shall have charge of, and keep a register of, all papers communicated.

One of the Secretaries shall, if practicable, be resident out of London.

13. THE TREASURER.—The Treasurer shall receive all moneys due to the Society, and make up all payments ordered by the Council, keeping an account of all such receipts and payments. He shall keep a printed receipt-book for subscriptions, and every receipt and cheque shall be signed by him. He shall submit to the Council a written report of the financial state of the Society, for presentation to the Annual General Meeting. All moneys shall be banked in the name of the Society. The Treasurer shall not hold office for more than five consecutive years.

14. LIBRARIAN.—The Librarian shall not hold office for more than five consecutive years.

15. EDITOR OF THE "TRANSACTIONS."—The Editor of the *Transactions* shall not hold office for more than five consecutive years.

16. THE COUNCIL.—The Council shall have the management of the affairs of the Society. They shall meet as required during the session of the Society. Notice of the hour of meeting shall be transmitted by the Secretaries to each Member. Four shall form a *quorum*, and six shall form a *quorum* when the question of the expulsion of a Member has to be considered. The President, or any three Members, may call a special meeting.

They shall determine questions by vote, or by ballot if demanded, the Chairman having the casting vote. They shall call a special meeting or meetings after the close of the session to determine what communications and illustrations shall be published in the *Transactions;* they shall make such regulations and issue such orders as shall appear to them conducive to the good government of the Society and to the proper management of its affairs, subject to the Rules of the Society. They shall appoint Investigating Committees as may be required.

17. THE SOCIETY'S TRANSACTIONS.—The Transactions of the Society, under the designation "*Transactions of the Otological Society of the United Kingdom*," shall be published in such manner as the Council may direct. The *Transactions* shall be presented to all Members of the Society who have paid their annual subscription. No Member whose entrance fee or subscription is in arrear shall be presented with the *Transactions*. The Council shall be empowered to present, in the name of the Society, copies of the *Transactions* to such scientific bodies as they may think fit.

18. INVESTIGATING COMMITTEES.—The Council shall, as occasion demands, appoint Committees of Members of the Society, and, if desirable, one or more Non-Members, for the purpose of investigating questions of importance in Otological science, and shall have authority to grant such sums of money as they may deem necessary for the expense of these investigations. The reports of such Committees shall be

presented to the Council to be dealt with as they may deem most advisable. Such Committees shall be called "Investigating Committees": they shall consist of not less than three Members. The Investigating Committees shall continue to act until they have reported on the subject referred to them, or been dissolved by the Council. Every Member who has acted on an Investigating Committee shall sign the final report, or shall state in writing his reason for declining to do so.

The report shall be first received and considered by the Council, which may be specially summoned for that purpose, and shall afterwards, with their sanction, be presented at an Ordinary Meeting of the Society.

The Council shall be informed by their Secretary of the retirement of any Member of an Investigating Committee, in which case the Council may at their discretion appoint another Member of the Society to fill the vacancy.

The Investigating Committees shall render to the Council an account of all money received by them for the purpose of their investigations.

The Council shall have the power to dissolve an Investigating Committee whenever they may deem it expedient.

19. ORDINARY MEETINGS.—(*a*) The Ordinary Meetings of the Society shall be held on the first Monday, or some other day selected by the Council, at 4.30 P.M., in December, February, March, and May, in London or elsewhere, as the Council may decide.

(*b*) Each Member of the Society shall have the privilege of introducing a visitor at every Ordinary Meeting, on entering his visitor's name in the attendance-book; but no visitor shall be introduced more than twice in the same session.

(*c*) The business of the Society at the Ordinary Meetings shall be:

(i) The reading of papers and report of cases.

(ii) The demonstration of cases.

(iii) The exhibition and examination of specimens (microscopical or otherwise), drawings, instruments, models, methods of treatment, and the discussion of Otological subjects.

(*d*) At the Ordinary Meetings of the Society nothing relating to its laws or management shall be brought forward.

(*e*) At Ordinary Meetings ten Members shall form a *quorum*.

(*f*) Additional Ordinary Meetings shall be held if the Council think them necessary.

(*g*) Papers (which must be written in form fit for printing) shall not, as a rule, be of such length as to occupy more than fifteen minutes in delivery. An abstract of each communication, for publication in the Medical Journals, shall be given to the Secretaries before the end of the Meeting at which the communication is read.

(*h*) Members wishing to read papers previously approved by the Council, or show cases, specimens, &c., shall, if possible, give notice thereof to the Secretaries ten days before the meeting.

(*i*) All papers shall be handed to the Secretaries immediately after being read.

(*j*) In any discussion, each Member taking part shall write on a form provided for the purpose an abstract of his remarks, which shall be given to the Secretaries before the end of the meeting.

20. THE ANNUAL GENERAL AND SPECIAL MEETINGS.—The Annual General Meeting of the Society, for the election of the officers and other Members of the Council, shall be held in December. All proposals to enact, alter or repeal rules shall be proposed by the Council only at the Annual or Special Meeting of the Society, notice of all such proposals being transmitted to every Member, together with the summons to the Annual or Special Meeting. For the adoption of rules or changes so proposed, the votes of two-thirds of the Members present must be in favour of the proposal.

Any Member of the Society may suggest to the Council alterations in the rules, by letter addressed to the Secretaries.

A Special General Meeting may be called at any time by the Council, or at the written request of any ten Members, giving at least fourteen days' notice by letter to every Member

of the Society resident in the United Kingdom, of the time of meeting and the business upon which it is summoned, and no business shall be entered upon at such meeting except that which has been notified.

21. LIBRARY REGULATIONS.—(*a*) The Library shall be open at the same hours as that of the Medical Society—viz., from 1 P.M. to 6 P.M. daily, except on Saturdays, when it will be closed at 3 P.M.

(*b*) Members may obtain books at 11 Chandos Street between those hours on signing a book provided for that purpose. But any books or periodicals may be placed by the Council on a separate list, such books not being allowed to be removed from the Library.

(*c*) A book must be returned at the expiration of a fortnight if wanted by any other Member. The Librarian will in such a case write to the Member in whose name the book was taken out.

(*d*) If the book be not returned within four days of such notice, a fine of 6*d*. will be charged for each day that the book is retained beyond such days of grace.

(*e*) Members resident in the country can obtain books by writing to the resident Librarian and transmitting the cost of postage. Such books are sent at the borrower's risk.

(*f*) A Member taking out a book will be held responsible for its being returned in good condition.

THIRD ANNUAL MEETING.

Monday, December 1st, 1902.

The PRESIDENT, Professor URBAN PRITCHARD, IN THE CHAIR.

The following reports were read and accepted :

REPORT OF THE COUNCIL.

The Council have great pleasure in presenting their Report. Since the inauguration of the Society in 1899 continued and satisfactory progress has been made. During the past Session sixteen new Members have been elected, and one Member has intimated his resignation, which the Council have received with regret. The Society now consists of eighty-three Ordinary Members and one Honorary Member.

During the past Session one Special and four Ordinary Meetings have been held. These Meetings have been well attended, and increasing interest has been taken both in the exhibition and in the discussion of cases and problems of Otological interest.

The Council wish to put on record their high appreciation of the courtesy shown to Members during the recent visit of the Society to Dublin, and also to thank those Members of the profession in Dublin and its surroundings, not Members of the Society, who contributed so largely to the success of the gathering.

In conclusion, the Council trust that the Volume of *Transactions* to be issued very shortly will be regarded as an evidence of their desire to stimulate the study of Otology

and to extend the sphere of usefulness of this department of the healing art.

TREASURER'S REPORT.

The financial position is, on the whole, satisfactory. We have paid off the loan of £50, and have a balance in hand. But our finances have been increased by £16 through the liberality of the Guarantors of the Otological Congress, who have given the Society the balance remaining over after all expenses of the Congress were paid; also by some donations from the original Members of our Society. I think the printing expenses might be cut down by exclusion of some of the matter now included in the *Transactions*.

LIBRARIAN'S REPORT.

Thanks to the kindness of Dr. HERMAN KNAPP, of New York, the Library has been enriched during the year by a series of the Archives of Otology from the commencement to the end of vol. xxix. This valuable series is complete with the exception of thirteen numbers in vols. xi.–xxii. In addition, the following donation and exchanges have been received.

Members are reminded that contributions of Books and Pamphlets will be welcomed, also that the contents of the Library may be consulted on application to the Resident Librarian, 11 Chandos Street, London, W.

ADDITIONS TO LIBRARY: SESSION 1901–1902.

DONATIONS.

GRAZZI, V., "Sulla Etiologia dei mixoni delle fosse nasali." (*Boll. del Prof. Grazzi.* Fasc 5, Amo xx., 1902.)
(*The Author.*)

EXCHANGES.

AUSTRO-HUNGARY. *Jahrbücher der Gesellschaft der Ungarischen Ohren und Kehlkopfärzte.* Bd. vii. 1901. Budapest. 1902.

DENMARK. *Dansk oto-laryngologisk Forenings Forhandlinger.* Bd. x. Copenhagen. 1901.

FRANCE. *Annales des Maladies de l'Oreille, du Larynx, du Nez et du Pharynx.* Paris. 1902.

Archives Internationales de Laryngologie, d'Otologie et de Rhinologie. Paris. 1902.

Revue Hebdomadaire de Laryngologie, d'Otologie et de Rhinologie. Bordeaux. 1902.

GERMANY. *Monatsschrift für Ohrenheilkunde sowie für Kehlkopf-, Nasen-, Rachen-, Krankheiten.* Berlin. 1902.

ITALY. *Bolletino delle Malattie dell' Orecchio della Gola e del Naso.* Firenze. 1902.

Archivio Italiano di Otologia, Rinologia e Laringologia. Torino. 1902.

UNITED STATES OF AMERICA. *Archives of Otology.* Vol. xxxi. New York. 1902.

THE EDITOR OF THE "TRANSACTIONS" REPORT.

The *Transactions* for 1901–1902 are now in the press. The estimate given by Messrs. J. and A. Churchill is about £41, apart from the illustrations, the cost of which is borne by the Members to whom they belong. I beg to point out that Clauses (*i*) and (*l*) of Rule 19 should be expunged.

Dr. DUNDAS GRANT and Dr. MACNAUGHTON JONES were appointed Auditors.

Dr. THOS. BARR and Mr. MACLEOD YEARSLEY were appointed Scrutineers.

The following gentlemen were elected as Officers and Members of the Council for the Session 1902–3.

President: URBAN PRITCHARD.

Vice-Presidents: PETER MCBRIDE, EDWARD LAW, ARTHUR SANDFORD, CHARLES A. BALLANCE.

Hon. Treasurer: ALPHONSO ELKIN CUMBERBATCH.

Hon. Librarian: E. CRESSWELL BABER.

Hon. Editor of *Transactions*: ARTHUR H. CHEATLE.

Hon. Secretaries: W. JOBSON HORNE, HERBERT TILLEY.
Council: Sir WILLIAM DALBY, STEPHEN PAGET, JOHN STORY, WILLIAM MILLIGAN, H. SECKER WALKER, HUGH E. JONES.

Clauses (*i*) and (*l*) of Rule 19, formerly Rule 18, were repealed.

TENTH ORDINARY MEETING.

The following gentlemen were elected Members of the Society:

HENRY WILLIAM CARSON, ANDREW LITTLE, ANTHONY McCALL, GEORGE MURRAY, EDWIN ARTHUR PETERS, HUNTER FINLAY TOD.

Sequestrum comprising internal auditory meatus and the whole of the labyrinth, except a small portion of the outer wall of the vestibule and cochlea. Bone cavity grafted without reopening post-auricular wound.

By HUGH E. JONES.

The patient, K. L., female, who is now twenty-one years of age, has been under Mr. Jones' care at the Liverpool Eye and Ear Infirmary more or less regularly since February 1896. Previous to that date she had been treated for six months at another hospital for interstitial keratitis.

Family History.—The mother gave the following history respecting the results of thirteen pregnancies: two miscarriages; two still-born children at term; five children who died in infancy; four children who are still living—two of these are boys, and have escaped characteristic congenital sy., two are girls, both of whom have had interstitial keratitis, and one of whom, the patient, is also totally deaf (the numerical order is not stated).

History of the ear disease.

Feb. 24th, 1896.—Discharge from right ear just begun. Discharge of left ear of much longer duration.

Patient has not always been deaf and can talk quite well,

though she has marked "deaf intonation," and is now quite deaf. Usual antiseptic treatment prescribed.

June 15*th*.—Complete right facial paralysis.

August 22*nd*.—Stacke-Schwartze operation. Right.

September 23*rd*.—Bone cavity covered with healthy-looking granulations; discharge quite inodorous.

October 28*th*, 1896, till *January* 15*th*, 1897, no visit. Recurrence of right keratitis. Purulent discharge from both ears. Attendance very irregular till *December* 6*th*, 1897. Sequestrum found lying in lt. meatus.

December 9*th*, 1897.—Stacke-Schwartze operation. Lt. Attended at intervals of three weeks during 1898. In October lt. facial nerve became paralysed. Irregular attendance during 1899–1902. Slight suppuration continued and granulations appeared from time to time and were treated with chromic acid, gutt. alc. c. hydrarg. perchlor., &c. &c. He had not been able to find anywhere in the notes a statement that the cavities were at any time dry or cicatrised nor that the discharge had ceased.

July 1902.—Patient reappeared after a long absence (nearly two years), during which the ears do not seem to have caused any discomfort. Discharge from both ears, granulations in both tympana. On examination with probe the roughened bone corresponding with inner wall of the right antrum was felt to move.

Operation for the removal of the sequestrum.

July 16*th*.—Patient admitted into hospital, and three days later the large sequestrum was removed from the right ear by a post-auricular incision. (Chloroform.) So far as the condition left by the original Stacke-Schwartze operation (*August* 1896) would allow, the Ballance method of dealing with the meatus was adopted and the post-auricular opening stitched up. Owing to the very free venous bleeding which followed the extraction of the sequestrum, necessitating firm packing of the cavity with gauze, the cavity caused by the removal of the sequestrum could not be explored with the probe. It was lined throughout with granulations, and its walls were probably composed as follows: *apex*, compact

bone of the apex and anterior surface of petrous; *anterior wall*, the compact casing of the carotid canal; *roof and posterior wall*, the tegmen and outer shell of the petrous, which was probably defective around the internal auditory meatus and over the superior semicircular canal; *floor*, floor of tympanum and roof of jugular fossa. During the two months following the operation the highest temperature recorded (morning and evening chart) was 99°.

The amount of pus formed caused him to put off from day to day and week to week, until *September* 11, any attempt at skin-grafting, when an inspection of the cavity, after two days special preparation, showed that there was a chance of success. Mr. Jones was still doubtful of the wisdom of attempting to line the deep and small inner end of the cavity (dura mater), as it was not unlikely that blood or serum would collect at that point, and one could not be certain of the asepticity of the part.

September 11*th.—Skin-grafting operation.*

As seven weeks had passed by since the removal of the sequestrum the post-auricular wound was very firmly healed, and as the whole of the funnel-shaped cavity could be easily seen from the wide meatal orifice, he determined to try grafting without reopening the wound.

The following method was devised and found to be easy and fairly successful. A long medium-sized aural speculum, which was found on trial to reach very nearly to the end of the cavity, was covered with three or four layers of cyanide gauze; a small quantity of gauze was also packed into the end of the speculum; a layer of gold leaf was then applied over the gauze, and finally over this layer was wound a large Tiersch skin graft with its raw surface outwards. The speculum with its coverings was then introduced into the cavity on a thick probe. By pressing the probe well into the end of the cavity, it was possible to withdraw the speculum over the probe without disturbing the various layers around it, leaving a funnel-shaped space in the centre of the gauze.

By careful pressing on the sides and end of this space the

graft was made to apply itself closely to the walls of the bone cavity. The outer rim of gauze was then carefully turned into the central space and packed firmly. The first dressing was done on September 18 (*i.e.*, one week after grafting). The graft appeared to have taken everywhere except at the extreme apex. This method of applying the graft seemed to him to be worthy of further trial in cases where, for some reason or other, there is an objection to reopening the wound. A special instrument for introducing the graft might be of assistance.

December 1902. *Present condition of the patient.*

The apex of the cavity still showed a small circular red

FIG. 1.

Sequestrum from temporal bone (× 2).
Antero-External aspect.

patch which was moist, all the other walls were sound, and there was no obvious discharge. (Later on suppuration recurred in the deep part of the cavity.)

Hearing—nil.

Since the operation it has been noticed that the right naso-labial fold has reappeared, and that the right angle of the mouth moves distinctly upwards when the patient makes any attempt to shut the eyes, and *when she smiles.* The muscles about the orbit and brow do not appear to act in the slightest degree. It is difficult to believe that, after six years of complete paralysis, the nerve should begin to act within three months of the removal of the sequestrum, especially when one remembers that the nerve must have been entirely destroyed from the internal auditory meatus to the level of

the pyramid, if not lower. Any further change will therefore be watched with interest.

The sequestrum includes the whole of the labyrinth and the greater part of the internal auditory meatus, and also the first part of the Fallopian aqueduct. The following parts were wanting. A portion of the antero-external wall of the vestibule and of the first turn of the cochlea, that is, the portion of the inner tympanic wall between the oval and round windows, and the adjoining portion of the promontory, and the whole of the second part of the aqueduct. The superior semicircular canal had been excavated and the bone filling the centre of the other semicircles was disintegrating.

The specimen is 23 mm. long (arch of p.s.c. to apex).

16 mm. high (arch of s.s.c. to lowest part of p.s.c.)

10 mm. thick (promontory to edge of int. aud. meatus).

Dr. BARR pointed out the bearing of such a case upon our knowledge of the function of the semicircular canals, which are regarded by many physiologists as the "static organs" of the body. He asked whether any noticeable disturbance of equilibrium had been observed in this patient. In the case of a similar sequestrum removed by him from a boy some years ago, there had been no disturbance of equilibrium, a very interesting point as bearing upon the views held as to the functions of the semicircular canals, especially their relation to the maintenance of the due equilibrium of the body.

Mr. FAGGE said the specimen was very much like one he removed from a boy aged eight in Guy's Hospital last September. The surgeon under whose care he was had opened the antrum for chronic suppurative otitis media with incipient facial paralysis. The opening of the antrum had done very little good as regards the otorrhœa, but the facial paralysis had subsided somewhat. There was a purulent discharge from the meatus and also from the sinus behind the ear: the temperature oscillated with occasional attacks

of vomiting. There were no eye changes. He decided to do more, and began the radical mastoid operation. He explored the antral region and found a cavity lined by granulations, some of which were sprouting from the outer surface of the dura. While excavating in that region he found an area of white dead bone which was obviously loose and unconnected with any other part of the temporal bone. He enlarged the cavity very much indeed, and eventually removed a sequestrum like that now shown. It comprised the whole of the internal ear, extending from the base of the petrous bone internally to a quarter of an inch beyond the internal auditory meatus. After that had been removed —and its removal necessitated the gouging away of a large portion of bone which was not diseased—the dura mater of the middle and the posterior fossæ were exposed in continuity over a large area obliquely crossed by the line of the superior petrosal sinus. From the commencement the case seemed to him to be tuberculous, which opinion the result of the operation confirmed. The facial paralysis did not appear to have been altered in any way by the operation. He had alluded to the case on account of the previous speaker's remarks on the question of equilibrium. Previous to operation he never thought of the possibility of the internal ear being affected, perhaps because in a general surgical ward he was not as careful over such things as an aural surgeon ought to have been. If the case remained under his care he proposed to unite the facial nerve to the spinal accessory nerve.

On account of the entire absence of symptoms pointing to an interference with control of equilibrium, he regretted he had not performed careful tuning-fork tests, which would, no doubt, have suggested involvement of the internal ear in addition to the diagnosis of external pachymeningitis which led to his operation.

P.S.—No history of vertigo was ever elicited during the attendance of my patient K. L.—H. E. J.

A case of carcinoma of the auditory meatus, or tympanum, invading the under surface of the temporo-sphenoidal lobe of the brain.

By E. DEANESLY.

A man, aged forty-four, was admitted to the Wolverhampton and Staffordshire Hospital on March 26, 1902, with the following history: He had had scarlet fever as a boy, and had suffered ever since from a discharge from the right ear and slight deafness.

Since October 1901 he had had severe headache, chiefly over the left eye, and his sight had become impaired. He sought advice on account of the headache, and did not mention his ear until questioned.

The right meatus was completely blocked by a polypus, the size of a pea, and the hearing on this side was much impaired. Intense optic neuritis was found on both sides. Beyond these two facts and a little unsteadiness of the gait, there were no other objective symptoms whatever.

Three days after admission the ordinary post-aural operation was performed. Neither the mastoid antrum nor the mastoid cells contained pus. The polypus and some granulation tissue were removed from the tympanum, which was not eroded or excavated, and did not present any obvious difference from an ordinary case of otitis media.

The sigmoid sinus was exposed and found healthy. The tegmen tympani was then perforated, a small incision made in the overlying dura, and the brain punctured in several directions with a moderate-sized hollow needle, with no result. The cerebellum was exposed behind and below the sigmoid sinus and bulged without pulsation through the incision in the dura. It was punctured in several directions without result. Gauze drains were inserted and the wound closed. Headache was immediately relieved by the operation, the wound healed readily, and the patient left the hospital a month after admission, apparently quite well.

The optic neuritis, however, showed no improvement.

Three months later he was readmitted. The headache had recurred and become intense. He had also become quite blind. His speech was slow, but his mind was quite clear. There were no localising symptoms beyond slight nystagmus and a complaint of giddiness.

An attempt was made on July 18 to give relief to intracranial pressure by draining the arachnoid space beneath the cerebellum. He remained, however, in a semi-comatose condition after the operation, and died three days later.

The post-mortem examination showed turbid fluid in the

FIG. 2.

Carcinoma of meatus invading middle fossa of skull and brain.

ventricles, probably due to septic meningitis. The right middle fossa of the skull was almost filled with a mass of growth measuring one inch in height and two inches in each diameter. The centre of the growth corresponded to the lowest point of the middle fossa, and not to the roof of the tympanum, as if the growth had extended along the Eustachian tube before bursting into the cranial cavity. The whole mass of growth was embedded in the temporo-sphenoidal lobe of the brain.

The photograph shows the right petrous and part of the right parietal bone, viewed from above and behind. A wedge-shaped piece has been removed from the centre of the tumour

for microscopic examination. The microscopic section showed the structure of a spheroidal-celled carcinoma.

Dr. PERMEWAN referred to a case very much like Dr. DEANESLY'S, except that the patient was not yet dead, though he feared she soon would be. The case was brought to his notice by another aural surgeon, who had removed what he called a polypus from the ear of a lady aged fifty-two. She had a history of suppuration from the ears since childhood, following scarlet fever. The piece of polypus removed appeared to be of the ordinary character. The symptoms were not relieved at all, and pain became very prominent; so the patient was brought to him with a view to operation. The ordinary post-aural operation was done, what appeared to be inflammatory tissue being cleared out from the cavity exposed. The patient then passed out of his hands into the care of the original attendant. He saw no more of her for three months, at the end of which time she was brought back in a rather worse condition than she was in at first. The wound behind the ear had healed, but the large meatus was filled up by a mass of foul granulating tissue. There was now severe pain, which could only be relieved by large doses of morphia. There was no rise of temperature. The granulating material was examined and found to be typical epithelioma. Afterwards the glands below the ear began to enlarge, and the patient got into a very bad state of health, with very acute and almost constant pain. She was still alive, and it remained to be seen what was the exact source of the tumour. There could be no doubt, however, that it was a malignant growth springing from the temporal bone. The patient had facial paralysis, which had come on two days before she was first seen by him. The polypus, according to the patient's husband, had been there for more than twenty years, and had produced no dangerous symptoms, but had all that time been attended with foul discharge, only kept down by constant syringing. The point of interest was as to the cause of the malignant transformation of the polyp.

Dr. BARR said the case reminded him very much of one he

published some time ago, the specimen from which was shown at the London meeting of the International Otological Congress. The specimen had quite the appearance of that now shown, only it was three or four times larger, and the microscopic examination showed it to be distinctly sarcomatous. The symptomatology was very much like that of the one exhibited. The polypoid excrescences were very marked and recurred repeatedly after removal: they were of a tough fibrous nature. Pain was also a marked feature, persisting for weeks and months. Ultimately intracranial symptoms, which were almost exactly those of cerebral abscess, developed, and the skull was trephined over the temporo-sphenoidal lobe with the expectation of finding an abscess. It was found, however, that, instead of a collection of matter, a large sarcomatous mass occupied the position of the temporo-sphenoidal lobe. On examination after death it was shown that the mass had originated in the middle ear, which had been the seat of an old purulent disease, and from that had sprouted upwards through the tegmen to the middle fossa of the cranium. This case seemed to support the view that, in certain conditions, simple inflammatory neoplasms in the middle ear may after a time acquire a malignant character. The practical lesson from such cases was that recurring fibrous polypi should be looked upon with suspicion, that microscopic examination should be early carried out, and the radical mastoid operation should not be delayed too long. Extension to the intra-cranial cavity may in this way be averted.

Dr. MILLIGAN wished to mention a case which he recorded several years ago before the British Otological Association. It was that of a child two-and-a-half years old, who was brought to the hospital with a polypoid growth of a rather sloughy-looking nature protruding from the ear. He removed the growth and sent it the same day to the Clinical Research Association, asking for an immediate report, there being a suspicion that it was sarcomatous. He received a report saying that the growth was ordinary inflammatory connective tissue. Exactly a week afterwards it had

recurred, looking precisely as it had done the week before. He removed it again, and this time sent it to Guy's Hospital, and received a report, signed by the same gentleman who had signed the original report, saying that it was an actively growing sarcoma. He thought the so-called polypoid excrescence was merely a portion of a deep-seated growth, but he could not exactly find out where the latter originated. He kept the child in the hospital as long as he could. The mother, however, was very anxious to get her home, and therefore he could not keep her in the hospital any longer. He wrote to the local medical man, and asked him if he would, in the event of death taking place, communicate with him, so that he could go to the country and perform a post-mortem, as he was particularly anxious to have the specimen. He received due notice and went, and on opening up the child's head found a large sarcomatous growth quite twice the size of that shown by Dr. DEANESLY, which protruded externally in the form of a polypus, and had gradually increased and pushed the temporo-sphenoidal lobe to the side. There was intense œdema of the brain and an immense amount of fluid at the base of the brain. He had seen several cases of the same nature, and would like to corroborate what Dr. BARR had said, that in the cases where there was any rapid recurrence of growth it was essential that an immediate histological examination should be made. Dr. PERMEWAN had referred to the question of pain, which reminded him of a case he saw some years ago, which he fully believed was an epithelioma of the middle ear, occurring in an old gentleman about seventy years of age. There was intense pain in the ear and facial paralysis resulted. The conclusion he arrived at was that it was probably malignant, but a point he wished to emphasise was the almost complete inefficiency of morphia in such cases. The patient had intense pain, and although large doses of morphia were administered they did not seem to have the slightest effect. He could not say definitely that the case was malignant, but he thought there was very little doubt it was a malignant growth springing from the middle ear.

Mr. SECKER WALKER mentioned the case of a child of seven years of age under his care at the present time, which began with facial paralysis, and subsequently a polypus appeared in the middle ear. This had been removed before Mr. WALKER saw the case, and as it recurred, the complete mastoid operation was decided upon. There was no suggestion of growth, but during the operation, on removing the outer shell of bone, the mastoid and petrous were found filled with a soft red, easily bleeding mass, which on being examined by the pathologist was pronounced to be an angio-sarcoma. As much of the growth was removed as possible, but recurrence had taken place, and the child was gradually becoming weaker. Mr. WALKER hoped to show the specimen at a later meeting of the Society.

Mr. ABBOTT said there were still other possibilities as to the exact nature of the growth, and mentioned a case of his own in which there was a growth of very small glandular-celled carcinoma, almost like the cells of a rodent ulcer. There was in this case a discharge of cerebro-spinal fluid from the meatus, which fluid also formed a large fluctuating swelling on the side of the head. The patient had a sprouting mass in the meatus, and a second above and behind the ear. She was shown at the Society last year. He was unable to get a post-mortem, but secured microscopic sections. He believed the pain, the offensive discharge, and the early facial paralysis and sprouting granulations were the chief signs on which one had to rely for diagnosis in early cases of new growths.

Mr. WHITEHEAD asked whether any one present had ever had a successful result after performing the operation. He had only performed two such operations, with fatal results in both cases.

Mr. CHEATLE said Mr. BALLANCE had shown at the Society a case of sarcoma, and the patient was living some months after the operation. Particulars of the case were published in the second volume of the *Transactions*.

Dr. BRONNER mentioned a case in which the patient had died three or four years after the operation.

A case of epithelioma of the middle ear.

By ARTHUR H. CHEATLE.

The patient was a woman, aged sixty-three years, who came to King's College Hospital complaining of deafness and discomfort in the left ear of only a few weeks' duration. There was no discharge or history of discharge.

The middle ear was occupied by indolent-looking granulation tissue, apparently pushing forward an intact drum, which was incised and showed the granulation tissue behind; some of this was removed with the curette and found to be epitheliomatous.

The progress of the disease had been very rapid during the two months following the examination. A mass had grown in the post-nasal space on the left side, pushing down the soft palate, which was paralysed on that side. The uvula was drawn to the right and the tongue showed paralysis of the left hypoglossal nerve. The pain in the ear had not been great but was increasing. Some enlarged glands could be felt in the neck behind the jaw.

The onset of the ear trouble was very insidious, the appearance, when first seen, closely resembling a subacute inflammation of the middle ear with a collection of fluid behind an intact drum.

Notes of a case of tumour of the meatus associated with an abdominal tumour, with section and drawing. Endothelioma.

By ARTHUR H. CHEATLE.

A lady, aged about forty years, was first seen on April 4, 1902. She had never had trouble in the ear until October 1901, when she had abscess in the right meatus which caused pain and discharge; this improved, but in the beginning of April 1902 the discharge recurred, and deafness had been experienced, with some pain, for several weeks. On examination, the anterior meatal wall was

swollen, almost blocking the passage, and a granulation was present between the swelling and the roof of the meatus. There was no swelling or tenderness outside the auricle. Everything pointed to a boil, and it was treated as such. She was not seen again until July 26, 1902, when she stated that the treatment ordered at the first visit had relieved her and that the ear seemed well until May or June, when it began to get stuffy again with occasional shooting pain. On examination the aspect of affairs was precisely the same as at the first visit. This was so suspicious that a piece was cut out for microscopical examination and Mr. SHATTOCK reported that it was an endothelioma, whilst others have pronounced it epithelioma. Finding that it was a malignant growth, arrangements were made for a thorough removal. Before this was done the patient's doctor found out that she suffered from some abdominal trouble, and on examination discovered a big lump in the lower abdomen.

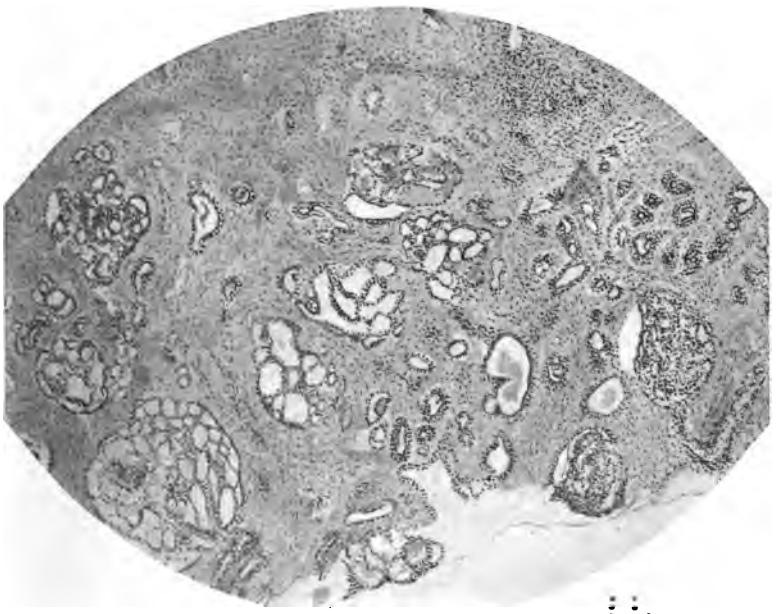
A thorough examination was made by Dr. HERBERT SPENCER, under an anæsthetic, and his report was as follows:—

"In the abdomen is a tumour, in places cystic, but for the greater part feeling solid, not absolutely fixed, reaching nearly to the umbilicus. The tumour extends behind the uterus and is distinct from it; it is clearly an ovarian tumour. The uterus is not enlarged, is in front of the tumour and slightly movable. On the left side of the cervix in the situation of the left utero-sacral ligament, and evidently in the peritoneum, are two small nodules as big as the end of the finger, hard and fixed. They appear to be secondary growths in the peritoneum." Dr. SPENCER decided not to interfere unless, in a few months' time, it was found that the "malignant secondary growths" had increased in size.

In the face of the opinion concerning the abdominal trouble an operation on the ear was clearly unnecessary.

She was sent home with orders to keep the ear clean with lysol, and has since reported that it is quite comfortable and that she is hearing well.

FIG. III.



Endothelioma of the Meatus.

Mr. ARTHUR H. CHEATLE'S case.

Dr. JOBSON HORNE asked Mr. CHEATLE to state precisely the position occupied by the growth in the meatus, and whether he considered there was any causal relationship between the abdominal and the meatal growths.

Mr. CHEATLE replied that the swelling was in the anterior meatal wall very close to the outside; it had no connection with the parotid; it was growing in the meatus. He came to the conclusion that probably the meatal growth was secondary to the abdominal one.

Dr. JOBSON HORNE said the whole interest of the case turned on the fact of the term "endothelioma" having been introduced. They had first to decide whether the growth was or was not an endothelioma. This very much depended upon what meaning should be attached to the term "endothelioma." Personally, he expressed no opinion upon the section exhibited; but, speaking generally, he looked upon endotheliomata as a group of tumours with malignancy of a low degree and local character, and instanced a "mixed parotid tumour" as a type of endothelioma. It was therefore difficult for him to accept the view that the meatal growth was secondary to the abdominal growth. The situation of the meatal growth was consistent with his own idea of an endothelioma: it was in the line of the visceral clefts, and the exact origin of the growth was of importance, inasmuch as it might be an instance of a morbid process throwing a light on a problem of development—the relationship of the tympanic ring to Meckel's cartilage and the quadrate bone. He hoped that the exact nature of the meatal growth and its relationship, if any, to the abdominal growth would be determined.

Dr. MACNAUGHTON JONES said it was well known that endothelioma was one of the rarest of all forms of malignant disease, but it was only in recent years that any light had been thrown on the subject. So far as he knew, no instance of endothelioma of any portion of the ear had yet been recorded. It was only of late years that it had been shown to exist in the ovary, and the exact nature of the growth had been decided and accurately described. There

was an interesting point in regard to Mr. CHEATLE'S specimen, namely, that some authorities regarded endothelioma rather as a form of angio-sarcoma than a distinct malignant growth with characteristic features of its own. Angio-sarcoma described as endothelioma had been recorded by Cullen and other American authorities as occurring in the ovary, and it had also occurred in the rectum. In true endothelioma there was a new formation of blood corpuscles and blood-vessels originating in pre-existing blood-vessels, from the endothelium of which a new growth was derived. It invaded a great part of the ovarian tissue, and was generally associated with diseased ova. He had only seen one case of true endothelioma. It was in Berlin, and a drawing of the microscopical section of the growth appeared in his (Dr. MACNAUGHTON JONES'S) work.

If the specimen shown was one of endothelioma of the meatus it was extremely rare, and one on which it would be well to have a consensus of opinion that it was really endothelioma, and not some form of sarcoma of the meatus. As to the point raised as to its being primary or secondary in the meatus, those cases which were described in the ovary had unquestionably been regarded as malignant, but he could not look on the growth as one secondary to that in the pelvis. They were sometimes not endotheliomata, but peritheliomata-growths arising not within the vessel but outside it. Those cases which occurred in the pelvis were generally malignant, ended fatally, and were often associated with large blood cysts. He asked the author if there was any appearance of a thinning of the meatal wall and any blood tumour.

Mr. CHEATLE said there was not.

Dr. MACNAUGHTON JONES said he would expect, if it were an endothelioma, there would be enlargement and a breaking down of tissue, with some form of blood tumour as a result of the endothelioma.

Mr. HUNTER TOD said that in the December "Archives of Otology," Dr. Alexander Franz had published several cases of tumour of the external meatus, and had described three cases of endothelioma of the meatus.

Two cases of large retro-auricular opening (after operation for cholesteatoma), treated by paraffin injections.

By ADOLPH BRONNER.

Dr. BRONNER said that in most cases of cholesteatoma of the middle ear, and in some cases of caries of the mastoid process, it was essential that a permanent opening should be established behind the ear. As soon as the disease has been cured this fistula should be closed. This was usually done, if the opening be large, by means of a flap of skin. The disadvantages of this method were, that it caused slight disfigurement, it was not always successful, and, in children at least, it necessitated the use of a general anæsthetic. In the last two cases which were under his care, he tried to close the opening by injections of paraffin. Three to four injections of about half a drachm of paraffin were made under the skin, at the edge of the posterior, inferior, and superior parts of the opening. The point of the syringe was directed towards the centre of the middle ear.

The advantages Dr. BRONNER claimed for this method over the ordinary flap operation were, that it did not give rise to any disfigurement, it was always successful, it did not usually require a general anæsthetic, and last, but not least, a small opening could be retained, so that the cavity could be watched and, if necessary, treated.

Dr. CRESSWELL BABER asked what were the measurements of the openings.

Dr. SCANES SPICER asked how long the author had had the case under observation. He and others had found that paraffin injections into other parts (*e.g.*, the nose) wandered. That was a rather important matter, because it gave rise to conditions of graver import than the original deformity, and at the present moment assurance was needed that this would not take place with untoward results, or could be efficiently dealt with if it did.

Dr. BRONNER, in reply, said he could not remember the

exact size of the opening. He had used paraffin injections in a good many cases, but had never seen the paraffin wander.

A case of cholesteatoma of the attic and antrim with a good result by operative opening of these parts with preservation of the ossicles, membrana tensa, and cholesteatoma matrix.

By DUNDAS GRANT.

Grace W., *æt.* eight, was referred to him on account of pain in the left ear and a history of otorrhœa of twelve months' duration. The disease had probably originated in an attack of measles three years previously, but the pain of which she complained had come on suddenly one week before Dr. DUNDAS GRANT saw her. She complained of slight vertigo and singing noise in the left ear, pain over the mastoid region and slight swelling; a blister had previously been applied. A granulation projected in front of the handle of the malleus; there was no perforation sound; it thus seemed pretty certain that the polypus grew from the attic, and it was accordingly removed. It was then evident that there was a large perforation in the membrane of Shrapnell. Two days later there was a copious discharge of blood and skin-like formations. He then decided to operate, but in view of the excellence of her hearing and the integrity of the membrana tensor and ossicles he proposed to endeavour to preserve these. Accordingly the operation was carried out as for the ordinary radical mastoid operation; he chiselled away the outer wall of the attic under the protection of an angular guard, also the bony wall intervening between the mastoid cells and the external auditory meatus, and thus opened into a cavity filled with broken-down epithelium, and lined by a fairly homogeneous shiny membrane. He scraped out the contents, leaving the matrix *in situ*, and turned back a flap from the posterior wall of the membranous meatus, then filled the cavity with iodoform moistened with 1 in

20 carbolic solution. Unfortunately the occurrence of an outbreak of scarlet fever necessitated the removal of the patient to her home six days after the operation, where she went through an attack of this disease. From the time of the operation the patient was free from the pains from which she had previously suffered, and the ear was nearly dry in from six to eight weeks.

Dr. KERR LOVE asked whether the hearing was tested before the operation, and if so, whether it was any different in acuteness afterwards.

Dr. BRONNER asked whether it was a true cholesteatoma. It was often very difficult to make an exact diagnosis. Most cases of so-called cholesteatoma were simple accumulations of dried epidermis and pus.

Dr. DUNDAS GRANT, in reply, said the hearing was nearly as good before the operation as afterwards. With regard to the use of the term "cholesteatoma," the question was one of understanding what was meant by the term. The word "cholesteatoma" was used in general, in the sense of a secondary formation as the result of the invasion of the external epithelium into the cavities of the middle ear with subsequent desquamation. Strictly speaking, a cholesteatoma was a tumour consisting of laminated epithelial elements. He did not think that any one could exactly say that the case shown was not actually a true cholesteatoma. It was quite probable, especially in view of the fact that it occurred in such a young person, and had therefore developed in an unusually short time, for a secondary cholesteatoma of that size to form. It was quite possible that it was a genuine case of cholesteatoma which had opened a way through the membrane of Shrapnell.

Large hyperostosis removed from left auditory meatus. Patient and specimen shown.

By HERBERT TILLEY.

Patient was a female, aged twenty-seven years. She

received a blow on the left ear seven years ago, which was followed by discharge and deafness.

The discharge ceased after a few weeks, but the deafness gradually increased.

Towards the end of August she bathed in the sea and next day complained of earache, which has continued since with varying degrees of severity.

The pain was especially severe at night and radiated over the left side of the head, teeth and throat; it was of a "plunging" character.

Since the onset of the pain there had been some "moisture" coming from the ear passage, but nothing in the nature of a free discharge.

On examination the left meatus was seen to be completely occluded by a hard swelling situated on its posterior wall and at the entrance of the meatus.

The smallest probe could not be passed into the meatus.

Bone conduction was good, but the patient could not hear watch or tuning-fork by aërial conduction.

There was no obvious discharge from the meatus, neither was there any œdema or swelling over the mastoid process, but the tip of the latter was painful on deep pressure.

Temperature 99°.

Patient was admitted to hospital and the complete radical operation was carried out. The meatus tympanum and mastoid antrum were full of old inflammatory products of a cheesy consistency, while the tympanic ossicles were extensively affected by caries.

The importance of grafting the internal wound was urged upon the patient, but she refused a second operation.

The external wound healed by first intention, and the patient left the hospital with the greater part of the internal wound covered by epithelium, but it was three weeks since she had reported herself, and during this time a granulation had sprung up in the tympanum, and there was a slight discharge. These would have to be further dealt with.

Dr. HERBERT TILLEY dwelt upon the ease with which these broad-based hyperostoses could be removed by means of an

incision over the mastoid, and thought that this method should always be adopted when there was a suspicion of suppuration or inflammation behind the obstruction.

Mr. CHEATLE said that Dr. TILLEY spoke as if skin grafting was a panacea for continued discharge after operation, and that if a case was skin grafted it would never discharge. In his opinion, if the post-aural operation was done properly, and the after treatment carefully attended to, the ultimate result was just as good as with grafting.

Dr. DEANESLY said that in two cases he deliberately abstained from grafting, because at the time he was not absolutely convinced of its efficacy, thinking, with Mr. CHEATLE, that if the operation was done completely the wound would heal up, although it would possibly take a little longer. In both cases the result was unsatisfactory. There was a marked stenosis, and the wound did not heal for many weeks after the operation. He was convinced that if the cases had been grafted the result would have been more satisfactory.

Mr. CHEATLE said he had seen cases which had been grafted by the best masters of grafting, but which still continued to discharge.

Mr. CHARLES HEATH thought it only fair to state that he knew of a great many cases which had not been skin grafted which ceased to discharge, and could produce at the next meeting half a dozen such cases, so that grafting was not a *sine quâ non* for stopping discharge. If the patient wore a small drainage-tube stenosis could be prevented practically in all cases. It was his habit to let the patient wear a drainage-tube of about $\frac{1}{2}$-inch diameter at the time of the operation, replacing it with a-$\frac{3}{8}$ inch tube two days after the operation, and in the course of three or four weeks a tube of $\frac{1}{4}$ inch, which the patient could wear as long as there was any discharge. It caused no pain and prevented stenosis. Within the last eighteen months he had probably done 120 such cases, and in only two had stenosis occurred. One of these was done in the country, and he was unable to manage the after treatment at all, and the drainage-tube was omitted

after a week's use. The other patient, though operated upon in town, left off using the tube when returning home to the country; in neither case was the stenosis complete, and in the latter it was easily rectified.

Dr. KERR LOVE thought the great point in such cases was not whether the grafting was done or not, but whether the operation was thoroughly performed. He had operated on about 300 cases, and in such operations, when he thought he had done the work thoroughly, had removed all diseased bone, splitting the meatus so as to give a thoroughly free access; he neither used drainage-tubes nor, as a rule, grafted, but by thoroughly packing and keeping the cavities dry they almost all ultimately healed. He recognised the value of grafting in a minority of cases.

Dr. MILLIGAN thought there was a certain looseness in Dr. TILLEY'S terminology. He did not suppose that Dr. TILLEY'S meaning was that if a case had suppurated and then ceased suppurating, and there was an exostosis, he would still perform a complete post-aural operation. If there was any suppuration going on he thought it was advisable to consider the question. The matter was discussed last year in reference to certain cases which were shown. He ventured to make a suggestion in reference to the case exhibited which possibly might prove of some benefit, namely, that after the granulation was scraped off, if a little cotton-wool dipped in dilute nitric acid was kept in contact with the wound for a short time it would stimulate the part to heal. The whole value of the grafting operation seemed to him to lie in the fact that it accelerated very materially the healing process. It was not a question of stopping discharge. The whole cavity must be aseptic, and the primary operation must be thoroughly done before any grafting could be carried out. If there was an aseptic cavity he thought there was no doubt at all that grafting was an enormous boon in shortening the after treatment of such a case.

Mr. CHEATLE questioned whether these wounds were ever aseptic.

Dr. DUNDAS GRANT said that if the cavity left was a very large one, he had no doubt it would heal much quicker by grafting than by any other method, just as in the case of a very large ulcer on the leg, which, if grafted, would heal quicker than by any other method. If, on the other hand, the cavity left was a small one, he thought one might reasonably expect it to be lined by spontaneous proliferation of epithelium from the edges of the skin over the granulations.

Dr. TILLEY, in reply to Dr. MILLIGAN'S criticism as to the terminology, said there was a "suspicion of suppuration," because the exostosis was so great that it was impossible to pass a probe into the meatus. The patient also said there was a certain amount of moisture. But when he saw her in consultation there was no moisture. He therefore could only form an opinion by taking into account the history of the trouble and the symptoms from which she was suffering when he saw her. These certainly suggested that suppuration had been, and probably was, going on. He had performed some fifteen cases of skin grafting, and was certain it was an enormous advantage in saving time. He thought that all the members could bring forward cases which had dried up in about six weeks without grafting, provided the antral cavities were small. If there was a large cavity the epithelium had to creep over it, and it might be impossible to get such a cavity perfectly dry, however carefully it was dressed; under these conditions grafting became essential to an ultimate cure.

Dr. MILLIGAN said, when he used the term "aseptic cavity," he presumed that the orifice of the Eustachian tube was entirely sealed up during the time of the operation, a most important factor in the success of the radical operation.

Case of objective clicking tinnitus.

By E. CRESSWELL BABER.

The patient, a lady, aged thirty-five years, was first seen November 8, 1897, with a history of a clicking noise chiefly

in the right ear, which came on after an attack of influenza in February 1896.

On examination, a faint clicking noise could be heard by the observer in either ear, loudest on the left side, with or without an auscultation-tube. The pharynx showed spasmodic contraction of the velum, not always coincident with the noise. She was treated, amongst other drugs, with valerian and bromide. The continuous current was applied externally and to the palate, and an astringent paint was used to the pharynx.

On March 3, 1898, the note made was: "Noise almost ceased. It only comes when she makes a muscular movement now." The patient was not seen again till recently (November 15, 1902), when she reported as follows: "The noise has never ceased entirely. There have been two bad attacks since the last note. Two months ago she had a cold which aggravated the noise. The latter varies much in frequency, and is very rapid when bad."

Present state.—A clicking noise, which has often a reduplicated character, can be heard with or without the auscultation-tube in the left ear, more faintly in the right.

H.D. whisper, perfect both sides.

T.F.a[1]. Rinne, mastoid, R+.L+.

Bone conduction: both mastoids, perfect.

R.M.T. slight manubrial injection, opaque, somewhat retracted.

L.M.T. opaque, somewhat retracted.

During the noise no movement of either membrane can be detected by the sight or with an ordinary manometer (the meatus being full of air). Politzerising does not change the appearance of the membranes or arrest the noise.

Pharynx.—Small granulations on the margin of the velum and small vessels on the posterior wall, which is catarrhal. With each noise a slight spasm with depression of the soft palate takes place, which is most marked on the right side.

Larynx normal. No movement of the thyroid cartilage can be detected during the noise. Cocaine sprayed into the pharynx diminishes the noise slightly for a minute or two.

By posterior rhinoscopy the cushions of the Eustachian tubes are seen to be congested, but no movement of them can be detected. A movement of the levator cushion can be seen during the noise. No thickening in the vault of the naso-pharynx.

Dr. MACNAUGHTON JONES said that he sent, some years ago to the PRESIDENT to examine, a very interesting case similar to that shown by Mr. BABER, namely, that of a young lady who was afflicted in exactly the same way, in whom there were periodic rhythmic spasmodic movements of the palatal muscles. The PRESIDENT would remember the peculiar noise, which was a little louder than in the present case. He could detect no movement whatever of the membrana tympana, although he had examined it several times. He examined Mr. BABER'S that day with a magnifying speculum, and there was obviously no movement. His patient ultimately got perfectly well, although she was affected for about six months.

She was rather anæmic and nervous; had suffered from a throat trouble, and had had her tonsils removed. The treatment he adopted was the ordinary tonic treatment by iron and strychnine. He also applied to the palate for some time the faradic current and also the galvanic current, the patient ultimately getting perfectly well under the treatment. The catamenia, which were irregular at the time she was affected, were perfectly restored in character and regularity.

ELEVENTH ORDINARY MEETING.

Monday, February 2nd, 1903.

The PRESIDENT, Professor URBAN PRITCHARD, IN THE CHAIR.

The following gentlemen were nominated for election at the next meeting:

JAMES DONELAN, M.B. (R.U.I.), M.Ch., 6 Manchester Square, London.

JAMES KERR, M.D., D.P.H. (Cantab.), 3 Hanger Lane, Ealing.

HAROLD FREDERICK MOLE, F.R.C.S., 1 Tottenham Place, Clifton.

THOMAS HENRY PINDER, M.R.C.S., Alexander Road, Manchester.

CYRIL GEORGE RUSSWOOD, F.R.C.S., Hardwicke House, Shrewsbury.

The Secretary announced that, under Rule 17, the Council had appointed a Pathological Committee consisting of Mr. ARTHUR CHEATLE, Mr. C. H. FAGGE, Dr. JOBSON HORNE, and Dr. WYATT WINGRAVE; with Dr. F. W. ANDREWES and Mr. SHATTOCK to act as referees.

The microscopical examination of the discharge in 100 *cases of middle-ear suppuration, with an analysis of the results, having special reference to the presence of tubercle and "acid-fast" bacilli.*

By WYATT WINGRAVE.

This investigation was undertaken not with the view of making an exhaustive bacteriological search, but chiefly with

the object of testing the value and reliability of microscopical examinations for acid-fast bacilli available under ordinary circumstances.

The sources of the material were for the most part patients who had not previously undergone any special treatment, and although many of them afforded family and personal evidence of tuberculosis, they were not purposely selected for that reason, but were taken in the ordinary course of out- and in-patient practice at the Central London Throat and Ear Hospital, together with a few private cases. Mr. St. George Reid, the bacteriologist, kindly co-operated in verifying the morphological characters of the micro-organisms.

Collecting the material.—Having experienced the unreliability of scrapings taken from the superficial regions of the auditory meatus, the discharge was always taken from the deepest available part, as near as possible to the diseased area. In some instances the granulations themselves, with the pus and débris, were triturated with a 2 per cent. solution of sodium sulphate, and centrifuged before staining.

SYNOPSIS OF RESULTS.

Age—Under 1 year	2
2 to 6 years	6
7 to 14 „	21
15 to 21 „	29
22 to 31 „	18
32 to 51 „	14
52 to 62 „	1
Sex—Equal in number.	
History of Phthisis, family or personal	42
Acid- and Alcohol-fast bacilli	24
B. T. (presumptive)	17
Pseudo-B. T.	7
Of the 17 B. T., 12 had history of phthisis.	
„ „ 5 had no history of phthisis.	
Of the 7 P. B. T., 5 had history of phthisis.	
„ „ 2 had no history of phthisis.	
Squames and Pus Cells present together	41
Squames alone	21
Pus alone	38
Bacteria:	
Staphylococci	41
Diplococci	20

Streptococci	7
Bac. proteus vulg.	14
Mic. tetrag.	4
Bac. coli	3
Gonococci	3
Bac. subtilis	2
Aspergillus nig.	1
Leptothrix	1
Diphtheria (Klebs-L.)	1
Yeasts	1

Routine staining.—The discharge was removed with a small curette, squeezed between sterilised cover-glasses, and fixed by heat. After boiling in carbol fuchsine for three minutes the smear was placed in 25 per cent. sulphuric acid until all colour had disappeared; but if on washing with water the colour reappeared the acid bath was repeated. After further washing in water, if apparently colourless, it was soaked in absolute alcohol for five minutes, counterstained with methylene blue, washed, dried, and mounted in xylol balsam.

Although this process may be carried out while the cover-glass is held by Cornet's forceps, it will be found that the details can be more thoroughly and as quickly performed in a test-tube, using a liberal supply of solutions.

Specimens from the same cases were also stained by Gram's method, which proved more reliable than methylene blue as a general stain. They all resisted the action of 5 per cent. solution of tartaric acid after prolonged soaking.

Synopsis of Table of Results.

On referring to the table of results it will be seen that the cases were all suffering with chronic suppuration of the middle ear with the three following exceptions:

No. 50 was one of chronic non-suppurative disease of the middle ear in a patient suffering with pulmonary tuberculosis.

No. 52 was that of an infant ten months old suffering with mastoid abscess and a discharge of four days'

duration, under Dr. JAKINS'S care. The abscess and discharge both contained gonococci.

No. 76 was also that of an infant twelve months old with a discharge of five days' duration. This also contained gonococci.

It will be seen that in twenty-four cases bacilli which resisted both acid and alcohol were present. Of these, seventeen conformed to the morphological characters of the bacillus of tubercle, and, further, were accompanied in twelve instances with either a personal or family history of tuberculosis. These are described as presumably genuine tubercle bacilli. The remaining seven cases showed bacilli varying in several respects (size, shape, &c.) from the orthodox features, although affording the correct staining reactions, and are grouped as *Pseudo-tubercular*, as suggested by Pappenheim. In these also there was a history of tuberculosis in four cases. The number of bacilli present in each smear varied considerably, from twelve in each field to less than a dozen in a whole smear.

We now know that all acid-fast bacilli are not necessarily tubercle, and in considering their significance it may be well to enumerate some of the chief non-tubercular acid- and alcohol-fast bacilli which have been reported.

1. *Smegma Bacillus.*—This is acid-resisting, but is readily bleached by alcohol—less so by acid. It is smaller than that of tubercle, and is said to be found only on the male genitals.

2. *Leprosy Bacillus.*—This may be disregarded in the present investigation, owing to its rarity in this country.

3. *Timothy and other Grass Bacilli.*—Resist both acid and alcohol, but inoculation experiments have proved negative.

4. *Lustgarten's Bacillus of Syphilis.*—The identity of this bacillus has not received satisfactory confirmation. It, however, is easily bleached by acid—less so by alcohol.

5. *Butter Bacillus.*—This is probably identical with a grass bacillus.

6. *Bacillus of Pulmonary Gangrene.*—This has been

described by Pappenheim* as a *Pseudo-tubercular bacillus*, while Fraenkel† attributes its resistance to acids to the putrefactive changes being rich in fatty acids, &c.; for when occurring in sweet sputum they give up their stain readily.

7. Lubarsch‡ also found similarly selective bacilli in: (*a*) Purulent bronchitis; (*b*) bronchiectasis; (*c*) abscess near hip-joint; (*d*) sebaceous cysts; in all of which cases inoculation results were negative.

8. Folli§ found acid-fast bacilli in three out of six cases of non-tubercular pulmonary gangrene. He observed that they were decolorised after five minutes' soaking in 5 per cent. solution of tartaric acid, while genuine tubercle bacilli required twenty minutes. This reaction I have not been able to confirm, as already mentioned.

In addition to these, there are many others which are referred to in the appendix.

Thus we have evidence that many bacilli exist which may be mistaken for tubercle, and we must not be too ready to accept their identity, whatever their source may be.

This investigation has revealed another possible source of error. In about 60 per cent. of the preparations epithelial squames formed a most striking feature; they retained the fuchsine to a remarkable degree, in spite of prolonged treatment by acid and alcohol. It was noticed that the older the squames the more vividly they retained the fuchsine, the younger ones being paler, whilst the most recent of all being unstained with fuchsine, but readily selecting the methylene blue. This property is probably due to the increase of keratin and fatty substances, the result of degenerative age-changes in the cell, and supports Fraenkel's suggestion that the fuchsine selecting and retaining power of some bacilli is due to the degeneration products and fatty acids of putrefaction.

These cells often break up into small, irregularly-shaped

* Pappenheim, *Brit. Med. Journ.*, June 14, 1902, Epitome.
† Fraenkel, *Brit. Med. Journ.*, June 14, 1902, Epitome.
‡ Lubarsch, *Deut. Aertz. Zeit.*, October 15, 1901.
§ Folli, *Rif. Med.*, August 27, 1901.

rods and granular clumps, which may readily be mistaken for micro-organisms of the acid-fast group.

They are of still further interest in possessing a diagnostic value, since if the smear be taken from the deepest part of the ear they afford strong presumptive evidence of cholesteotoma, especially, too, when, as not unfrequently happens, they are more numerous than pus-cells. They are invariably accompanied with a distinctive sour fœtor—that of decomposing epidermis, probably due to fatty acids and sulphur, in marked contrast to that of bony necrosis, which has more the character of phosphorus.

Cases of special interest.—No. 15 is that of a female with a strong family history of tubercle, four having died from phthisis. In addition to suffering with pulmonary tuberculosis, she is nearly blind with double optic neuritis, which Mr. TREACHER COLLINS attributes to a retrobulbar tubercular lesion. She has suffered with suppurative discharge from both ears for seven years, in which I have found bacilli on each of several examinations. The sputum afforded similar results.

No. 50 was one of chronic non-suppurative middle-ear disease of eight years' duration. There being evidence of some accumulation in the right ear, Dr. DUNDAS GRANT performed paracentesis of the membrane, evacuating a few drops of inspissated matter, which contained tubercle bacilli. His sputum afforded abundant evidence of the same bacilli.

Gonococci occurred in three cases, two of which were infants and one was a male aged thirty-nine. The presence of this organism is not without interest, especially during infancy.

In No. 74 tubercle bacilli were found not only in the aural discharge, but also in the pus of the cerebral abscess, operated on by Dr. DUNDAS GRANT. She had a strong family history of phthisis and was much emaciated, but made an excellent recovery.

Conclusions.—This investigation shows that acid- and alcohol-fast bacilli are demonstrable in a large proportion of chronic purulent ear discharges.

That in seventeen cases they were presumably tubercle bacilli, in so far that they conformed to the recognised morphological and staining characters and were for the most part associated with reliable clinical evidence of tuberculosis.

That in seven (pseudo-tubercle bacilli) cases, while conforming in a greater or less degree to the staining requirements, they were morphologically unlike tubercle bacilli, yet five of them had either a family or personal history of phthisis.

That success in their demonstration in a great measure depends upon the methods of collecting and staining, together with perseverance in search.

That in the peculiar selective action of the squames in retaining the carbol fuchsine—a property specially attributed to certain bacilli—we have at once a possible source of error in diagnosis and an explanation of the peculiar affinity of other bacilli for fuchsine.

TABLE OF RESULTS.

Column 1 refers to the nature of the aural disease.
„ 2 gives the duration of the aural symptoms.
„ 3. The sign + indicates that there was either a family history of tubercle or that there was clinical evidence of such in the patient, independently of the ear.
„ 6. B. T. refers to acid- and alcohol-fast bacilli, presumably tubercular.
P. B. T. represents pseudo-bac. of tubercle.
B. P. V. refers to *Bac. proteus vulgaris.*
N.B.—An exhaustive list of the bacteria found is omitted.
„ 7 records the organised cells present, in the order of prevalence.

	1.	2.	3.	4.	5.	6.	7.	
	Disease.	Duration.	History of Phthisis.	Age.	Sex.	Bacteria.	Cells.	Remarks.
1	C. S. M. E.	3	0	23	F.	Diplococci, staphylococci.	Pus, few squames.	
2	„	1 mo.	0	13	M.	Streptococci.	Pus.	
3	„	3	0	25	M.	Staph.	Squames, pus.	
4	„	6	0	13	F.	Staph.	Squames.	
5	„	21	0	21	M.	B. P. V., staph.	Squames, pus.	
6	„	2	0	16	M.	B. P. V.	Squames, pus.	
7	„	6	0	24	F.	None found.	Squames.	
8	„	14	0	17	F.	Dipl.	Squames, pus.	Cured.
9	„	31	+	36	F.	Staph.	Squames.	
10	„	3	+	14	F.	B. T., B. P. V.	Pus, squames.	
11	„	4	+	23	F.	P. B. T.	Pus, squames.	
12	„	6	0	20	M.	Staph.	Squames.	
13	„	4	+	34	F.	Staph.	Pus, squames.	
14	„	4	+	17	F.	Staph., P. B. T.	Squames.	
15	„	5	+	24	F.	Staph., B. T., B. P. V.	Pus, squames.	Optic neuritis.
16	„	—	0	—	M.	Staph., B. T.	Squames, pus.	
17	„	15	+	38	F.	Staph.	Squames.	
18	„	—	0	—	M.	P. B. T.	Squames.	
19	„	15	+	18	F.	P. B. T.	Squames.	
20	„	9	0	38	M.	B. T.	Squames.	
21	„	3	+	—	—	P. B. T.	Pus.	
22	„	7	+	15	F.	B. T., dipl.	Pus, squames.	
23	„	4	+	19	F.	Dipl.	Pus.	
24	„	7	0	11	M.	Staph., leptothrix.	Squames.	
25	„	4	0	17	F.	Dipl. staph.	Pus, squames.	
26	„	18	0	22	M.	Dipl.	Squames.	
27	„	20	0	34	M.	Staph., yeasts.	Squames.	
28	„	5	+	22	F.	B. T.	Pus.	Cerebral [abscess.
29	„	4	—	19	M.	Strept. bac.	Pus.	

	1.	2.	3.	4.	5.	6.	7.	
	Disease.	Duration.	History of Phthisis.	Age.	Sex.	Bacteria.	Cells.	Remarks.
30	C. S. M. E.	17	+	22	F	Strept.	Pus.	
31	„	12	0	19	M.	Dipl., B. T.	Pus.	
32	„	4	+	11	F.	B. P. V.	Pus.	
33	„	2	0	12	M.	P. B. T.	Pus.	
34	„	1	0	8	F.	Mic. tetrag.	Pus.	
35	„	16	+	21	F.	—	Pus. squames.	
36	„	20	+ (d)	24	F.	P. B. T.	Pus, squames.	
37	„	12	+	17	F.	B. T.	Squames, pus.	
38	„	?	0	14	M.	Strept.	Pus.	Cerebellar
39	„	4 mo.	0	4	M.	Staph., P. B. V.	Pus.	[abscess.
40	„	11	+	21	F.	Staph., B. T.	Pus, squames.	Gran. triturated, Stacke
41	„	40	0	62	F.	B. P. V.	Squames.	
42	„	18	+	18	M.	Staph., dipl.	Squames, pus.	
43	„	1	0	14	F.	Staph.	Pus.	Supp. glands.
44	„	3	+	21	F.	Staph.	Squames, pus.	
45	C. S. M. R.	6	0	18	F.	Asperg. n.	Squames.	The purulent discharge had ceased 2 years.
46	„	17	0	24	F.	Staph., B. subtilis.	Pus, squames.	Epithelioma.
47	„	—	+	7	M.	Staph.	Pus, squames.	Rad. mast. oper.
48	„	6	0	21	F.	Mic. tetrag.	Squames, pus,	
49	„	5	+	14	M.	Staph., dipl.	Pus.	
50	C. C. M. E.	8	+	27	M.	B. T.	Cascat. pus.	Paracent. tymp.
51	C. S. M. E.	12	0	21	F.	B. subtilis, staph.	Pus, squames.	
52	A. S. M. E.	4 dys.	+	10 m	F.	Gonoc., strept.	Pus.	Mastoid abscess.
53	C. S. M. E.	6	0	9	M.	Staph.	Pus.	Supp. glands.
54	„	4	0	8	M.	Staph.	Pus, squames.	
55	„	1	+	3½	M.	B. T.	Pus.	Died general tuber.
56	„	1	0	15	F.	Strept.	Pus.	Supp. glands.
57	„	16	0	20	F.	B. T.	Pus, squames.	
58	„	6	+	24	F.	Dipl., staph.	Squames.	
59	„	6	0	13	F.	Staph.	Pus, squames.	
60	„	2	+	20	M.	B. P. V.	Pus, squames.	
61	„	9	0	15	F.	Staph.	Pus.	
62	„	10	0	21	F.	Dipl.	Squames.	
63	„	4	0	19	M.	B. coli c.	Pus.	After 2 yrs' treatment.
64	„	20	+	33	M.	B. P. V.	Pus,	
65	„	12	0	37	M.	B. P. V.	Squames.	

	1.	2.	3.	4.	5.	6.	7.	
	Disease.	Duration.	History of Phthisis.	Age.	Sex.	Bacteria.	Cells.	Remarks.
66	C. S. M. E.	10	+	13	M.	Strep., B. T.	Squames, pus.	Right hemiplegia, optic neuritis (double).
67	,,	6	+	16	F.	B. T. (twice)	Squames, pus.	
68	,,	26	+	31	F.	No B. T.	Pus, squames.	
69	,,	2 mo.	0	4	M.	B. T.	Pus.	
70	,,	14	+	40	F.	P. B. T. (?)	Pus, squames.	
71	,,	—	0	4	M.	P. B. T.	Squames. pus.	Extremely fœtid.
72	,,	7	+	33	M.	B. P. V.	Squames, pus.	Pulmon. gangrene.
73	,,	5	+	6	M.	Staph.	Squames, pus.	Supp. glands.
74	,,	10	+	21	F.	B. T.	Pus.	Cerebral abscess.
75	,,	4	0	39	M.	Gonoc.	Pus, squames.	Adenoids and supp. glands.
76	A. S. M. E.	5 dys.	+	1	M.	Gonoc.	Pus.	
77	C. S. M. E.	6 mo.	0	5	M.	Dipl.	Pus.	
78	,,	15	0	35	M.	No B. T.	Squames.	Very fœtid, Stacke: cholesteatom.
79	A. S. M. E.	3 wks.	0	6 m	F.	Dipl. bac., staph.	Pus.	
80	C. S. M. E.	25	0	27	F.	B. P. V.	Squames, pus.	Rad. mast. op.
81	,,	11	+	37	M.	Staph.	Squames, pus.	
82	,,	8	0	18	M.	Staph.	Squames, pus.	
83	,,	13	+	14	M.	B. T.	Pus, squames.	
84	,,	20	0	22	F.	B. P. V.	Pus, squames.	
85	,,	6	0	12	M.	Staph.	Pus.	
86	,,	5	0	9	M.	B. P. V.	Pus, squames.	glands.
87	,,	$1\frac{1}{2}$	0	11	F.	No B. T.	Pus.	Enlarged
88	,,	21	0	22	F.	Staph.	Squames.	
89	,,	17	0	18	M.	Dipl., staph.	Squames, pus.	mast. abscess.
90	,,	$3\frac{1}{2}$	0	5	M.	Dipl., staph.	Pus.	Stacke; acute
91	,,	5	0	22	F.	Staph.	Pus.	
92	,,	30	+	35	F.	Mic. tetrag.	Squames.	Very fœtid.
93	,,	18	0	20	F.	No B. T.	Pus, squames.	
94	,,	5	0	10	M.	Staph.	Pus.	Supp. glands.
95	,,	6	+	12	M.	B. P. V.	Pus.	
96	,,	4 mo.	0	16	M.	Dipl., staph.	Pus.	Facial paralysis.
97	,,	15	0	35	M.	No. B. T.	Pus.	Very fœtid.
98	,,	20	0	27	M.	Staph., dipl.	Squames.	
99	,,	6	0	7	F.	Staph.	Pus.	
100	,,	2	+	27	M.	Mic. tetrag.	Pus.	

The clinical diagnosis and surgical treatment of tuberculosis of the temporal bone, considered with reference to the pathology and morbid anatomy of the disease.

By W. Jobson Horne.

"Tuberculosis of the ear, I venture to think, has not received the attention it deserves. The subject is beset with doubts and difficulties, and these, I trust, the discussion this evening will help to clarify.

The present paper, to economise time, is given in abstract form, and does not attempt to do more than draw attention to some of the doubtful points, and to put forward theories in explanation which may elicit discussion.

In the first place, it is a question whether tuberculosis of the ear should be regarded strictly as a form of middle-ear disease in precisely the same sense as any other form of suppurative otitis, or whether it should not more properly be grouped under tuberculous disease of bone. It will be noted from the title of the paper that the more comprehensive view of the disease is for the present tentatively held.

As regards the frequency of the disease, the statistics so far published are not sufficiently uniform to allow of an opinion being based upon them, and they present discrepancies owing to the inequality of evidence upon which the diagnosis has been allowed to rest. Some observers have required positive evidence, at times too difficult to obtain, even when the disease has far progressed, whilst other observers have contented themselves with a diagnosis based upon certain clinical phenomena, which may be briefly summarised as follows:

1. Absence of pain out of all proportion to the destructive character of the disease.
2. Insidious onset.
3. Marked loss of hearing-power.
4. Extensive destruction of bone, rapid extension to labyrinth, absence of headache and dizziness.

5. Progressive and destructive character, leading, perhaps, to facial paralysis or even severe hæmorrhage.

6. Absence of intracranial complications.

7. And in a particular group of cases, presently to be defined, considerable involvement of adjacent lymphatic glands.

These signs collectively go to make up a very strong case in favour of tuberculosis of the ear, but they all have this in common—they are only relative.

First, the absence of pain. Speaking generally, pain seldom accompanies diseases of the ear. It is, however, met with in myringitis. Those who have been fortunate in observing tuberculous disease in its earliest stages speak of it as commencing as a deposition of tubercle in the membrana tympani, unattended by pain. This absence of pain is not to be accounted for by an absence of tension, but by the absence of ordinary inflammatory phenomena. Then, again, acute middle-ear suppuration, especially in children, is commonly associated with pain, and yet in the tuberculous variety it is absent. Caries of the temporal bone is commonly attended with pain, and yet there is no form of ear disease with so much destruction of bone, and with so little or no pain, as tuberculous disease. In one case I had the opportunity of observing, not only was there extensive necrosis, but a subperiosteal abscess had formed over the necrosed area; and yet it was not pain, but facial paralysis, that drew attention to the ear.

I think one is therefore justified in saying that the absence of pain is not only deserving of comment, but that it cannot be entirely accounted for by the absence of ordinary physical causes. To this point I shall presently revert.

The insidious nature of the onset and progress of the disease follows upon what has been said, and I need not dwell upon this feature.

The rapid extension to the labyrinth, the absence of headache and dizziness, and the marked loss of hearing, are all features of diagnostic importance.

The progressive and destructive character, with, perhaps,

facial paralysis, or even severe hæmorrhage, make up an important feature in the clinical diagnosis, which asserts itself too late to be of any practical utility in the clinical diagnosis.

The presence or absence of intracranial complications and the enlargement of adjacent glands I shall deal with later in discussing the differential diagnosis of the primary and secondary forms of the disease.

Here I may refer to the frequency—of course, comparatively speaking—with which the disease is secondary to pulmonary phthisis; and when I say phthisis, let me add that, in my dead-house experience, it is usually secondary to cavity formation, and not to pure miliary tubercle of the lung. I am therefore led to assume that infection in such cases is by the sputum. Observers abroad have noted that the ear infection, when it occurs secondary to phthisis, takes place not uncommonly shortly before death. In this country, in our hospital practice, we seldom have the opportunity of observing the very last stages of phthisis, as such cases go to infirmaries. But I would suggest that the bedridden condition of the subject renders the sputum more liable to remain in the neighbourhood of the Eustachian tubes, and the ear more exposed to infection; and I would mention the danger of infecting with tubercle the ear of a phthisical patient by incautious catheterising and inflating to relieve an intercurrent aural affection. But, admitting all this, the fact remains that the suppurative disease of the middle ear occurring in a tuberculous subject is not necessarily tuberculous in nature.

The only positive proof of the disease being tuberculous is the detection of the tubercle bacillus within the affected area.

Negative evidence is of no value; failure to detect the *Bacillus tuberculosis* does not prove the disease to be non-tuberculous, nor does it disprove the possibility of its being tuberculous.

At times there is considerable difficulty in finding the bacillus, notwithstanding the presence of clinical evidence which leaves little doubt in the mind of the aurist that the disease is tuberculous both in nature and in origin.

By way of illustrating this difficulty let me quote a case, the specimen from which I show to you. At the post-mortem examination of this case the bacillus could not be detected in any of the numerous films made from the middle-ear and accessory cavities. Animal experiment was resorted to, and controlled without evidence of tubercle being obtained. The bacillus was eventually found in the external fascia and tissues, superficial to the area of necrosed bone. I need scarcely add that such a detection of evidence does not come within the range of practical otology.

The difficulty in obtaining positive proof arises from the bacilli being broken up and disintegrated in the presence of other organisms or of leucocytes. I do not propose to wander to the theories held about alexines, but it is important here to discuss some points in connection with the acid-fast property of the bacillus, a property upon which we depend for our microscopic diagnosis.

At first it was held by Unna and Klebs that the acid-fast property—*säurefestigkeit*—depended upon the presence of a fat in the bacillus. Aronson, in 1898, showed that the body was not a fat, but was of the nature of a wax, and that tubercle bacilli, after being treated with alcohol and ether alone, retained their acid-fast properties; whereas, if the mixture were allowed to act in the presence of hydrochloric acid, the bacilli were no longer acid-fast. This work has been confirmed by* Dr. Bulloch and Dr. Macleod, and to these observers I am largely indebted. It is therefore proved that the acid-fast property is due to the presence of a wax in the bacillus and not to a fat. For the moment I stop at the wax stage of my argument and pass to another point.

Various bacilli are met with in the ear, and the question arises whether any of these, by their sojourn in the neighbourhood of ceruminous glands, can absorb wax and become "acid-fast," and by simulating tubercle bacilli, vitiate a microscopic diagnosis. Even if that were possible, and I

* "The Morphological and Physiological Variations of the Bacillus Tuberculosis and its Relations." By William Bulloch, M.D. *Transactions of the British Congress on Tuberculosis*, vol. iii. p. 494.

believe it may be, it would be undesirable to refer to them as acid-fast bacilli. By acid-fast bacilli I refer to a well-defined group, the members of which have all been cultivated, and when injected produce pseudo-tubercle. A complete series of these were exhibited by Mr. Swithinbank in the Museum of the Tuberculosis Congress, and a descriptive list is given in the catalogue, and, so far as I know, that list has not since been added to. The presence of a member of this group in a film preparation from the ear would probably be due to faulty technique in obtaining the specimen.

On the other hand, a bacillus which has acquired an acid-fast property by absorption of wax from the meatus could be differentiated by culture and animal experiments. But this is a point requiring further investigation.

Now, to return to the body of the nature of wax, one of the constituents of a tubercle bacillus, and the one which gives to the bacillus that acid-fast property that is lost when the wax is broken up.

When a fat is decomposed, a glycerin and an acid are produced, whereas in the case of a wax another member of the alcohol series, other than glycerin, is liberated. The precise nature and position in the series of this alcohol has not at present been ascertained, but it apparently represents the measure of the acid-fastness of the bacillus.

I would suggest that the difficulty in staining the bacilli and the absence of pain in tuberculosis of the ear are due to one and the same cause: namely, the disintegration of the bacillus and the decomposition of its waxlike constituent with the resulting liberation of a product—tentatively styled an alcohol—which produces an anæsthetic effect. Such a theory would explain not only the causation of two important clinical phenomena of the disease, but also their correlation.

This absence of pain is not peculiar to tuberculosis when it affects the ear. I might instance cold abscesses of a tuberculous nature. Then, again, it is within our experience to have witnessed post-mortem examinations revealing tuberculous peritonitis, which, owing to the absence of pain, not-

withstanding a matting together of intestines by adhesions, has not been suspected during life.

Possibly an investigation into the nature of cerumen of the ear with reference to the points I have mentioned might not be altogether void of interest and of value.

I now pass to a brief consideration of some points which may guide us in the differentiation of a primary from a secondary infection of the ear. Primary tuberculosis is more commonly met with in children; I might almost say, from my own limited experience—exclusively—and I believe it to be of more frequent occurrence than is generally stated. Tuberculous disease may be added to an existing infection of the ear in an adult, but then that is not tuberculosis *de novo*. What has always appeared to me to be a feature of primary infection is the enlargement of the adjacent lymphatic glands; and here enters a great problem—the part played by the lymphatics in arresting tuberculosis. The enlargement of the glands, although in a sense evidence of disease, is at the same time the outcome of a battle fought to resist disease. The lymphatics form not only the lines of defence, but also, where inefficient, the paths of general invasion, and we have to consider this when we come to deal surgically with a case of primary infection.

In secondary infection of the ear with tubercle there is comparatively, if not entirely, an absence of enlargement of the adjacent lymphatics. Why they are not affected in the secondary form I must leave for a paper by itself.

A second point in differential diagnosis between primary and secondary infection is that in the latter there is evidence of tubercle elsewhere, commonly in the lungs, and, as I have already said, with cavity formation.

The tonsils and adenoids, when they play a part in the infection, I regard rather in the light of half-way houses than as primary foci.

A third point is the presence or absence of intracranial complications. It is hardly correct to say that tuberculous suppuration leads much less often than other forms of middle-ear suppuration to intracranial complications without a

qualifying addition. Intracranial complications seldom occur in the secondary form, but in the primary form the child is not uncommonly killed by a meningitis, as part of a general blood infection.

The practical bearing which discrimination between primary and secondary infection has upon the surgical treatment—and by that I mean an attempt to eradicate the bone disease—may be briefly stated as follows :

In the primary form, when the adjacent glands are involved, let these be removed, first attacking the more distal and least affected, the intention being to cut off the spread of infection, and so to localise the focus of disease to be removed at a later date.

When the disease is secondary to advanced pulmonary tuberculosis, a mastoid operation is seldom required ; on the contrary, a mastoid operation is more likely to be what a tracheotomy is to laryngeal tuberculosis—the beginning of the end.

I am desirous of expressing my indebtedness to the British Medical Association, under whose auspices the research is being conducted."

The diagnosis and treatment of tuberculous disease of the middle ear and its accessory cavities.

By WILLIAM MILLIGAN.

"Tuberculosis of the temporal bone was recognised as a definite pathological entity by the older school of clinicians long before the discovery of the tubercle bacillus was made by Robert Koch in 1882.

Its occurrence amongst phthisical patients is described in the writings of Schwartze, Nélaton, Barthez, Rokitansky, Toynbee, Zaufal, and others, and mention is made of its singularly painless onset, its protracted course, and its resistance to all ordinary methods of treatment.

The discovery of the tubercle bacillus, as the actual causative factor in the production of tuberculosis, gave a fresh impetus

to the study of tuberculous processes in general, and enabled the clinical and the scientific observer to differentiate with a sharp line of distinction between those processes which were of tuberculous and those which were of simple inflammatory or of pathogenic origin.

The immense importance of an accurate and final diagnosis both from the point of view of prognosis and of treatment requires no accentuation. In everyday practice difficulties of varying magnitude surround the question of diagnosis, and my object at this moment is to place before you certain points which the experience of various observers has shown to be of value in helping to determine the existence or otherwise of middle-ear tuberculosis.

Let me say that in using the phrase 'middle ear and accessory cavities' I include the tympanic cavity with its backward extension, the tympanic antrum, the adjoining mastoid cells developed around the antral cavity, and the whole course of the Eustachian tube from its tympanic to its pharyngeal orifice. On development and on clinical grounds this arrangement is, I think, accurate and convenient.

Tuberculous disease of the middle ear and its accessory cavities may be of primary or secondary origin.

Up to the present moment most observers regard secondary tuberculosis of the middle ear as of much more frequent occurrence than primary tuberculosis. The number of recorded cases of primary tuberculosis of the middle ear is, however, considerably on the increase, and I have but little doubt that in the future, when more exhaustive examinations are made than is the case at present, the number will be found to be by no means inconsiderable, especially amongst infants and young children.

Secondary tuberculous disease of the middle ear occurs more frequently as a complication of tuberculous disease of the respiratory tract, and especially of the lungs, than as a complication of similar disease affecting bones, glands, abdominal viscera, &c.

From the otological point of view, the existence or otherwise of tuberculous disease of naso-pharyngeal adenoid

vegetations is of the first importance. Given the presence of tuberculous adenoids, it is easy to see how readily the middle ear might become similarly infected. The evidence as to the existence of tuberculous adenoids is based upon the observations of comparatively few investigators. Pfluder and Fischer report primary involvement of the pharyngeal tonsil in 17 out of 161 cases examined, or a little over 10½ per cent.; McBride and Turner found 3 per cent.; Dieulafoy, 20 per cent.; Rethi, 6 per cent.

In a series of cases which I examined some years ago I found 16 per cent. of naso-pharyngeal adenoid growths of a tuberculous nature. In some cases bacilli will be found in the superficial layers of the mucosa, in others deeply embedded within the lymphoid tissue of this region. It must not, however, be forgotten that bacilli may penetrate an intact epithelial surface, and may be conveyed by the lymphatic stream to distant parts. Naso-pharyngeal adenoids may thus, with a perfectly intact surface, become a filter in the air-stream through which bacilli may pass on their way to other organs.

A tuberculous process once started in the succulent adenoid tissue of young children may spread by simple continuity of tissue, and may ultimately locate itself in the mucosa of the tympanic cavity or its adnexa.

If careful histological examination of the parietes of the Eustachian tube be made, the tuberculous process may be seen affecting the mucosa and the submucous adenoid tissue, and extending in a definite line of march from the naso-pharyngeal to the tympanic cavity. More attention paid to this particular point would, I believe, in all probability elicit the fact that naso-pharyngeal adenoids when tuberculous play an important rôle in subsequent tuberculous infection of the middle-ear cavities.

Nasal tuberculosis, although a distinctly rare condition, must not be ruled out of court in the consideration of this question. In a series of 476 post-mortem examinations, Williqk found but one case of nasal tuberculosis. Chiari likewise admits its rarity. Tuberculous middle-ear disease

as a complication of pulmonary phthisis may occur at any stage. Politzer has drawn special attention to its occurrence within the last few days of the patient's life.

Primary tuberculosis of the ear is stated by most observers to be of infrequent occurrence. Cases have been described, amongst others, by Küster, Haig, MacEwen Smith, Knapp, Goldstein, Zaufal, and myself. When occurring as a primary affection it may be the result of a blood or of an aerial infection. My own experience has led me to the belief that as a primary infection it is not so uncommon as is usually supposed; that its site of origin is frequently within the cancellous spaces of the pars mastoidea—in fact, an osteomyelitis of the part—and that it is prone to remain as a circumscribed local process until a secondary and a septic contamination of the middle ear takes place. My reasons for stating this are: (1) That in a number of cases of proved tuberculous disease the morbid process was very marked within the cancellous tissue of the mastoid process, and but slightly so within the middle ear itself; (2) that in several fatal cases (no naso-pharyngeal adenoids being present) no microscopic evidence of tubercle could be found; and (3) that in a number of cases of proved tuberculous disease operative interference (frequently more than one operation) has arrested the local disease, and the patient has been seen some years afterwards with no evidence of any other tuberculous lesion.

Predisposing causes.—The main predisposing causes are infection from association with tuberculous individuals, hereditary tendency to the catarrhal diathesis, improper and insufficient alimentation, unhealthy environment, the existence of any form of wasting disease—*e.g.*, scarlet fever, diphtheria, scarlatinal diphtheria, &c.

Exciting causes.—The more important exciting causes are the existence of tuberculous disease of some segment of the respiratory tract—*e.g.*, lungs, larynx, or naso-pharynx—previous middle-ear disease with an open perforation.

Tuberculous disease of the middle ear may run an acute or a chronic course.

In the acute variety the deposition of miliary tubercles (occasionally to be observed through an intact membrane) leads to multiple perforations, rapid destruction of soft tissues, and rapid formation of granulomata springing from the mucosa covering the promontory. The very rapidity of the process would appear to give no time for involvement of bone. The process is fulminating and superficial, and rapidly assumes the characteristics of a mixed infection, owing to the invasion by various pathogenic organisms. Tubercle bacilli are at first fairly profuse in the exuded pus. In such cases the organismal warfare is carried on with great vigour. Pathogenic organisms, however, gain the upper hand, and discharge which at first may have been found to show fairly large numbers of bacilli will now be found to swarm with cocci, whilst evidences of distorted, ill-formed, and almost unstainable bacilli will be seen in the miniature panorama of the microscopic field. The chronic and asthenic form of tuberculous disease of the middle ear is, however, the type most frequently met with, and the one to which special attention should be directed.

The channels along which bacillary invasion may take place are three in number—vascular, aerial, and mechanical. Vascular invasion may be through the general blood-stream, as in miliary tuberculosis of bones.

Infection along lymphatic radicles and lymph spaces may be demonstrated in cases of naso-pharyngeal origin with subsequent involvement of the mucosa and submucous tissue of the Eustachian tube.

Aerial invasion may occur along the lumen of the Eustachian tube or through an already present perforation of the membrana tympani. It is true that the action of the ciliated epithelium of the Eustachian tube should offer a formidable barrier to such an attack, and probably it does so. We know, however, how readily a diphtheritic inflammation of the fauces or post-nasal space involves the tympanic cavities, and we know that the march of diphtheria is by continuity of tissue. We know also how readily in scarlet fever extension of inflammation takes place from the fauces

and naso-pharynx to the middle ears. Why, therefore, should there be any difficulty in believing that bacillary infection of the middle ears may be brought about by extension along the lumen of the tube itself? Very probably in morbid conditions affecting the Eustachian mucosa ciliary action is interfered with, and the tube becomes for the time being a potential cavity.

Infection through an already existing perforation of the membrana tympani is no doubt possible, but probably is infrequent.

Mechanical infection is to my mind also a possibility. In infants and young children the regurgitation of food through the nasal passages is by no means uncommon, and it is quite possible that the violent muscular contractions of the pharyngeal constrictors so induced may drive infected and germ-laden food up the Eustachian tubes and into the tympanic cavities. The ingestion of tuberculous food may also infect parts with which it comes into contact.

The symptoms of tuberculous middle-ear disease may be grouped under two headings—subjective and objective.

The symptoms of acute tuberculous disease of the middle ear are somewhat anomalous. The occurrence of a middle-ear inflammation of medium intensity, and accompanied by considerable impairment of hearing in a subject of delicate constitution, might possibly suggest a diagnosis. It is only, however, by the discovery of multiple perforations or great destruction of the membrane, early and rapid formation of granulation tissue, early enlargement of the periotic ganglia, or early facial paralysis, that suspicion as to the true nature of the disease is usually aroused. The fact that such cases rapidly assume a mixed infective type tends also to mask an accurate diagnosis.

In the chronic and more usual form of the disease the main subjective phenomena are the occurrence of a middle-ear inflammatory process with a variable degree of impairment of hearing, with a varying amount of subjective tinnitus, with a varying sense of fulness in the head and affected ear or ears, and an almost complete absence of pain.

The objective indications of the disease are referable to the effects produced by the deposition of bacilli within the mucosa of the tympanic cavity and to the subsequent ulcerative effects which are thereby induced. In certain rare cases miliary tubercles may be seen through a pale and semi-transparent membrane. Being deposited, as they in the first instance are, in the superficial layers of the mucosa, they appear as yellowish areas in a pale pearly grey membrane. Owing to the caseating of their central portions, they readily break down and form superficial ulcers. This ulcerative process extends to the deeper portions of the mucosa and subsequently to the underlying bone. When deposited upon the mucosa of the membrana tympani they tend to produce multiple perforations. These perforations, by their coalescence, produce ultimately great destruction of the membrana tympani. The special characteristics of tubercular perforations are circular shape, pale, thickened, and indolent-looking edges, and general absence of reparative activity. It is claimed that tuberculous perforations are most frequent in the postero-superior segment of the membrane. Blake and Buck regard the occurrence of a painless perforation in the upper posterior quadrant of the membrane as pathognomonic of a commencing tubercular process.

The discharge from the middle ear, which in the early stages of a tubercular infection is thin and scanty, changes its characteristics when infected with mixed organisms, and becomes thick, creamy, and more profuse. In the early stages of the infection, when no bone lesion is present, it is odourless and, as a rule, free from admixture with blood. When succulent granulations appear, and especially when associated with an underlying carious process, blood-stained discharge is common. Granulations growing from a mucosa infected with tuberculous elements are pale, flabby, œdematous, and friable. They may grow directly from an area of ulcerated mucous membrane, in which case they often attain considerable size, and fill up in part or in whole the cavity of the tympanum or the tympanic antrum. When originating from an underlying carious focus they must be classed as

bone granulations, and are somewhat more friable than when growing from the mucosa itself, more vascular, and more prone to recur after removal. They are more frequently met with in tuberculous cases than in non-tuberculous. In 75 per cent. of my cases of tuberculous disease they have been a prominent feature, and in a certain number caseating areas have been observed on microscopic examination.

An objective indication of much importance is the early and readily detectable presence of bare bone. A distinct feature of tuberculous invasion of the middle ear is the readiness with which the underlying bone becomes eroded. Not only does this take place at a much earlier stage than is usual in non-tuberculous cases, but is prone to be more extensive, more rapid in its progress, and more likely to end in the formation of large sequestra. Owing to this early and, at times, extensive destruction of bone, facial paralysis is a symptom of frequent occurrence, and, if malignant—*e.g.*, sarcomatous—disease can be excluded, offers to my mind a very strong argument in favour of the underlying process being of a tuberculous nature. In 45 per cent. of my cases of proved tuberculous disease facial paralysis was present, whereas its frequency in non-tuberculous cases is probably not more than 2 to 5 per cent. In addition, it undoubtedly occurs as a much later symptom in non-tuberculous cases.

The extent to which the temporal bone may be destroyed without any objective evidence of what is actually going on is remarkable. I have on many occasions found practically the entire cancellous tissue of the mastoid process eaten away, leaving only a thin shell of more or less compact bone to preserve the underlying tissues. In one fatal case of double tuberculous otitis the two temporal bones were so eaten out by disease that only a thin shell remained upon which the middle fossæ were poised.

Carious erosion may, and frequently enough does, destroy the stapedio-vestibular articulation, and so opens up the cavity of the internal ear. Either in this way or by direct erosion into the cochlea the internal ear may become infected

with progressive destruction of the contents of the labyrinth. Habermann, Schwabach, Gradenigo, and Brieger found in nearly 33 per cent. of the cases of tuberculous disease of the middle ear submitted to a post-mortem examination perforation in one or both of the labyrinthine windows. When this occurs infective processes are prone to attack the pia-arachnoid, bacilli being conveyed along the perivascular sheaths surrounding the terminal filaments of the stylo-mastoid artery to similar sheaths surrounding peripheral filaments of the internal auditory artery—the terminal branch of the basilar.

Haike considers that a caric-necrosis of the foot-plate of the stirrup is pathognomonic of tubercle. While not prepared to go so far as this, it is a remarkable fact how frequently this articulation is destroyed in tuberculous middle-ear disease and how rarely it is in non-tuberculous processes. In young children destruction of bone is more common and more extensive than in adults. This, I believe, is due to two main causes. In the first place, tuberculous processes are common in infancy and youth, and in the second place, so long as the tuberculous process is in the ascendant, the bone crumbles away slowly but steadily. In adult life, where the cocci of a mixed infection gain the upper hand, the tendency to the formation of sequestra, &c., is not nearly so marked.

In my experience erosion of the outer table of the mastoid process is not so frequent in tuberculous cases as in non-tuberculous, and as a corollary from this subperiosteal mastoid abscesses are more frequent in non-tuberculous cases. On the other hand, I have met with quite a number of cases where, on making an incision behind the ear, the cortex was found perforated (although there was no suspicion of this beforehand), and the fistulous opening, sometimes as large as a sixpence, found to be filled up to the surface with a mass of creamy-white material of the consistence and appearance of putty. In fact, in some cases the superimposed periosteum appears to offer a more formidable barrier to the extension of disease than does the bone itself. In only two of my cases

have I found a Bezold's perforation. In a series of cases examined and reported upon by Grimmer, Bezold's perforation was found in about 20 per cent. of both tuberculous and non-tuberculous cases. Enlargement of the periotic ganglia is a most important indication. In non-tuberculous otitis media, excluding malignant disease, it is distinctly uncommon, and, when present, as a rule but few glands are affected. Such glands are tender if not actually painful to touch, are prone to vary in size with the virulency of the inflammatory process, and are more prone to induce a periadenitis.

In tuberculous processes early enlargement of glands is the rule. In fact, it is rare to find tuberculous middle-ear disease unaccompanied by enlarged glands. Such enlargement takes place also at an early stage of the disease. The infection spreads to surrounding glands until large masses and chains of glands are formed, often matted together, and exhibiting all stages of degeneration, caseation, suppuration, and calcification.

When suppuration has taken place and a fistulous track has formed, the granulations lining it are pale, flabby, and œdematous. If healing takes place the resulting scar is depressed, irregular, and unsightly.

The clinical picture, therefore, presented by a case of suspected tuberculous origin differs materially from that presented by a non-tuberculous case. On the one hand, the process is distinguished by its latency, its asthenic type, its painlessness, its tendency to multiple perforations, extensive bone lesions, early facial paralysis, and early enlargement of the periotic ganglia; on the other hand, we have an acute sthenic process, accompanied by pain, fever, and reactionary symptoms, with no great tendency—at least, not in its early stages—to bone or glandular involvement or implication of the facial nerve, and with an inherent tendency to resolution and repair.

It must not be assumed, because a suppurative otitis media occurs in a tuberculous subject, that therefore the aural infection is tuberculous also. Patients suffering from pulmonary

or laryngeal phthisis frequently suffer from pathogenic middle-ear disease, the process often enough, however, running an abnormal course, probably due to the want of tissue vigour induced by the already existing pulmonary affection ; nor, on the other hand, must it be assumed, because bacilli are not found in the discharge from the ear or in scrapings of granulation tissue, that therefore the process is non-tubercular. The actual demonstration of the bacillus, to my mind an essential and important factor in the final diagnosis of the case, is admittedly difficult, but, although admittedly difficult, is so important both from the point of view of prognosis and of treatment that it should never be neglected.

What, then, are the means by which this confirmatory and final diagnosis may be made?

Examination of the discharge from the middle ear is usually unsatisfactory, as bacilli are extremely difficult to find. Esche was the first to demonstrate the presence of bacilli in aural discharge. His observations have been confirmed by Nathan, Ritzefeld, Wingrave, Grimmer, and many other observers. In cases of acute onset, however, and if examined at a very early stage, bacilli may be found in considerable numbers. In the more chronic form of the disease —the form much more frequently met with in practice—the almost invariably mixed infection which exists tends to destroy any existing bacilli, and at the same time so to distort and alter those which remain that their detection is difficult and uncertain. The removal of small tufts of granulation tissue and their subsequent microscopic examination is more likely to yield positive evidence. Frequently they will be found to contain bacilli, caseating areas, giant or epithelioid cells. Another method of arriving at an accurate and final diagnosis when enlarged glands are present is to remove a gland, cut sections, and examine for bacilli. In this connection it is of great importance that a young and early infected gland be selected. It is of little use examining old and caseating glands, as bacilli are rarely, if ever, found with such a high degree of pathological disintegration. A

method which I have, however, tried, and with positive results, has been the aspiration of a glandular abscess with a fine exploring needle and the examination of the pus for bacilli. In the event of bacilli being found, either in sections of glands removed by operation or in pus from glandular abscesses, the inference, of course, is that the exciting cause for the glandular enlargement or abscess is of a tuberculous nature.

In cases of suspected tuberculous origin valuable information may at times be gained from an examination of sections of naso-pharyngeal adenoids. I have already referred at some length to this subject, and would merely add that in all suspicious cases a naso-pharyngeal examination should be part of a regular routine, and that where adenoids are present they should be removed, not only for a prospective microscopic examination, but as a valuable and necessary part of the treatment of the aural lesion, whether tuberculous or non-tuberculous.

The employment of tuberculin has not met with much favour in this country. Its indiscriminate employment in unsuitable and too far advanced cases undoubtedly brought it into disrepute. When judiciously employed—that is, in an early lesion and before a mixed infection masks the true nature of the lesion—it is useful, both from the point of view of diagnosis and of treatment. Very small doses should be used at first, and where there is a rise of temperature no further injection should be made until the temperature has fallen to normal again. Ferreri strongly recommends the tuberculin test, whilst Petruschky says that by its employment permanent cures are possible.

The value of inoculation experiments in this connection is variously regarded by many competent observers. Arloing, Leloir, Verneuil, Delépine, and others, look upon properly-conducted inoculation experiments as one of the most reliable methods of clinching the diagnosis. Villimen in 1865 first suggested the subcutaneous injection of suspected products.

Armanni in 1873 advised inoculations being made into the

anterior chamber of rabbits. Delépine in 1893 published some very definite instructions as to how such inoculations should be made, and suggested the routine employment of guinea-pigs as being the most suitable and at the same time the most sensitive animals for the purpose. Intraperitoneal injections are regarded by some as even more trustworthy than subcutaneous injections.

If such inoculations be conducted with proper antiseptic precautions the information afforded is reliable. The main objection to the method is the difficulty of securing the necessary licence and the interval of time which must elapse before a final decision can be arrived at. In my opinion it is a method well worthy of extensive trial, but in order to secure reliable results the material employed for inoculation should be a portion of bone and degenerated mucous membrane from the extreme periphery of the diseased process; in other words, where active tissue change is progressing.

Course of Disease.—In acute infections the disease runs a rapid course and ends fatally. As a rule, such acute cases occur amongst those already debilitated by tuberculous processes elsewhere, and frequently amongst those in the last stages of pulmonary phthisis.

The chronic and more usual types of infection run a slow, painless, and asthenic course. Exacerbations are usually the result of secondary pathogenic infections. Many patients succumb to the effects of the disease or to complications induced by the disease. In other cases, however, energetic and well-directed surgical measures will undoubtedly succeed in eradicating what has been a localised tuberculous infection.

The complications which result from tuberculous middle-ear disease may for convenience be divided into those attacking intracranial structures and those attacking viscera.

I have already touched upon the danger of tuberculous middle-ear disease infecting the meshes of the pia-arachnoid by bacillary extension along perivascular lymphatic spaces. Other channels of infection are through eroded and ulcerated bone—*e.g.*, tegmen tympani, tegmen antri, groove of lateral

sinus, &c.—whilst the tuberculous virus may also be conveyed along the perivascular sheaths of the carotid artery and jugular vein. The occurrence of intracranial abscesses is, in my experience at least, not very frequent in tuberculous cases. This is probably due to one of three causes: either the patients do not survive long enough to admit of the formation of secondary abscesses, or the destruction of bone which takes place so permits of drainage that the risks of secondary infections are minimised, or the fact that the pia-arachnoid membranes are more in the line of direct attack and more vulnerable than contiguous structures. In a certain proportion of cases the meningeal attack which carries off the patient suffering from tuberculous middle-ear disease is of a septic nature and due to a secondary infection by such organisms as streptococci, pneumococci, &c.

Recurrence of Disease.—In my experience, fresh foci of bone infection are apt to crop up from time to time even after the case appears to have been cured. This may be due to tubercle lying dormant for a time and becoming lit up as the result of some incidental or accidental cause, or to the incidence of a fresh dose of infection from a primary focus in some other portion of the body. Time after time I have met with severe disappointment, when a patient, apparently cured, has returned with all the evidences of fresh disease. Hope, however, "springs eternal in the human breast." No one should be daunted by such mishaps, but should strive for future victory. The broad fact, however, must remain that no definite assurance can be given that the disease will not recur.

Prognosis.—In considering the question of prognosis various factors have to be taken into consideration—*e.g.*, the age of the patient, the duration of the disease, the surroundings of the patient, the chances of competent nursing, the extent of the ear disease itself, and, if secondary, the character and extent of the primary source of infection.

The younger the patient the greater the risks. Extensive involvement of bone, marked facial paralysis, copious blood-stained and fœtid discharge, and masses of enlarged glands materially diminish the chances of recovery. Advanced

pulmonary disease or advanced tuberculous infection of any other organ must necessarily render the prognosis grave quite apart from the aural condition. On the other hand, primary involvement of the ear, although always serious, offers a much better hope of recovery, provided persistent and painstaking efforts are made to eradicate any focus of infection which crops up. This may mean repeated operative interference, but final success will amply repay the surgeon's toil. At least 40 per cent. of my cases of proved tuberculous infection have succumbed to the disease, some from tuberculous or septic meningitis, others from pulmonary phthisis, intestinal tuberculosis, acute miliary tuberculosis, and general marasmus.

The diazo reaction may possibly prove in future to be of value in estimating the life chances of the patient. In cases of pulmonary tubercle, at any rate, the presence of the reaction is regarded by Lorenz and Naegelsbach as of bad omen, whilst its presence is also held to contraindicate the employment of tuberculin.

That tuberculous disease of the middle ear is more frequent than is usually supposed will, I believe, some day be fully recognised. Amongst infants and young children, especially amongst the poorer children of our large cities, the disease in my experience is painfully common. From 50 to 60 per cent. of my hospital patients below the age of six suffering from suppurative middle-ear disease owe their disease to the ravages of the tubercle bacillus. In adults the disease is undoubtedly much less frequent. This, I am tempted to say, is due to two causes. In the first place, a great number of those affected with tuberculous middle-ear disease do not live to see adult life. Various complications — intracranial, thoracic, abdominal, or systemic—carry them off after their candle has flickered but a short time; and, in the second place, the incidence of a pathogenic infection grafted upon a tuberculous basis so masks the course of the affection that the original tuberculous element is eliminated, whilst the phenomena due to the presence of pathogenic organisms alone remain.

Treatment.—In cases of temporal bone tuberculosis occurring amongst patients suffering from advanced pulmonary phthisis or advanced tubercular disease in any other portion of the body, operative interference is contraindicated. On the other hand, however, retro-auricular abscesses should be evacuated, and sequestra which interfere with the maintenance of free drainage removed for the sake of the general well-being of the individual. In cases of comparatively early pulmonary phthisis, where the general condition of the patient is good, much benefit will accrue from operation. Free removal of diseased bone and succulent granulation tissue and the provision of efficient drainage will tend not only to materially lessen the patient's discomfort, but also to give him a better chance of successfully combating the ravages of the tubercle bacillus. It is hardly necessary to add that in such cases attention should be paid to clothing, diet, and the provision of an ample supply of fresh air. Change of air, residence at the seaside or in moorland country, and the exhibition of suitable tonics, &c., have all a place in the treatment of tuberculous disease of the middle ear, just as in the treatment of tuberculous disease of other regions of the body.

In infants and young children, amongst whom tuberculous middle-ear disease is unfortunately frequently fatal, treatment must be conducted upon both general and local lines.

From the general point of view, attention should be paid more especially to feeding, clothing, and the provision of an ample supply of fresh air. The source of the milk-supply should be investigated, and when it comes from a farm where the tuberculin test has not been applied it should be at once discarded. I believe it is always advisable to scald the milk supplied to infants, although not always necessary to sterilise it.

A free supply of fresh air should always be secured in the sleeping apartments of such patients, and when possible the child should spend the greater part of the day in the open air, well wrapped up, and if possible basking in the rays of the sun.

The question of local treatment is of paramount importance. The main indications are the employment of antiseptic treatment, the removal of diseased bone, the provision of free retro-auricular drainage, the removal of infected glands, and the treatment of concomitant nasal or naso-pharyngeal disease. Certain cases will, however, at once appeal to the surgeon as inoperable—viz., cases occurring amongst infants and young children suffering from marked debility, advanced facial paralysis, extensive bone disease, masses of enlarged glands, and copious fœtid and blood-stained discharge. On the other hand, where the general condition of the patient is good, even although locally there may be extensive disease, operation is indicated. A point of importance in such cases is the advisability of dividing the operation into stages. For some time past I have been in the habit of dividing such operations into two and sometimes into three stages, upon the first occasion opening only a post-auricular abscess or suppurating mass of glands, on another securing free retro-auricular drainage, and on a third making a serious effort to eradicate the disease. By conducting the case in this way the patient is not in the earlier stages of treatment—when his resisting power is slight—subjected to a prolonged anæsthesia and risk of surgical shock, a by no means hypothetical state of affairs amongst this class of children, already debilitated by the mixed toxins of tubercle and of sepsis.

I hold that, when the general condition of the patient permits, it is advisable to cut very freely beyond the fringe of disease. This may, and often does, necessitate extensive exposure of the walls of the lateral sinus and of the dura mater in the middle and posterior fossæ, but it is distinctly less risky to lay bare these structures than to leave an outlying zone of infected bone.

Where the facial nerve is completely paralysed, and where, in addition, the labyrinth is affected, my feeling is that the best line of treatment is to regard the condition as a tuberculous bone-abscess, and to clear out everything, even opening up the labyrinth very freely, regardless of the fact that

it is an organ of special sense upon which the operator is working. The risks to the life of the patient when the labyrinth has become opened up are immensely increased, the infective process being prone to advance along the perineural or perivascular sheaths to the pia-arachnoid membranes. In such cases the lesser of two evils should be chosen—the sense organ should be sacrificed in the hope that the life of the individual may be spared.

Where 10 per cent. of the hearing-power remains, an attempt should be made to preserve it. In such cases the ordinary radical mastoid operation may be performed, and should the operator be successful in eradicating the whole of the tuberculous disease, a subsequent attempt may be made to graft the antrotympanic cavity.

Treatment of Enlarged Periotic Ganglia.—Infected glands should be removed; otherwise, even in the event of being successful in the eradication of the existing aural disease, the patient will still be liable to general tuberculous infection. I need only remark here that the eradication of all diseased periotic and cervical glands is at times a most formidable operation, requiring a very extensive and deep dissection of the structures of the neck, and, unfortunately, often leaving a feeling, in my mind at least, that in all probability other glands remain behind which sooner or later will require removal. Sinuses leading to infected and suppurating glands should be thoroughly scraped and swabbed with pure carbolic acid, lactic acid, or turpentine.

Treatment of an Existing Facial Paralysis.—The extreme unsightliness of the unfortunate possessor of a paralysed facial nerve makes it incumbent to attempt to remedy the defect so far as is possible. In slight cases much can be done by the treatment of the existing middle-ear disease, by the exhibition of nerve tonics, and by the employment of a continuous current. Unfortunately, however, facial paralysis of tuberculous middle-ear origin is usually extensive, and due to carious destruction of the walls of the aqueduct, with exposure of the nerve to the septic contents of the tympanic cavity. The idea of uniting the distal portion of the facial

nerve to the trunk of the spinal accessory was first conceived by our distinguished member, Mr. C. A. BALLANCE, and has been successfully accomplished, the one disadvantage being that the patient, in order to smile upon the affected side of the face, has at the same time to shrug the corresponding shoulder. More recently Mr. BALLANCE has advocated the union of the facial to the hypoglossal nerve. The fact that the cortical centres of these two nerves are nearer to one another than are those of the facial and spinal accessory may possibly admit of a more ready and efficient response through their existing association fibres.

In conclusion, I should like to advance the following propositions:

1. That in all cases of middle-ear disease of suspected tuberculous origin search should be made for tubercle bacilli, either in the discharge, in tufts of exuberant granulation tissue, or in enlarged periotic glands.

2. That inoculation experiments (either subcutaneous or intra-peritoneal) afford a ready and reliable means of proving or excluding the tuberculous nature of the disease.

3. That a final and exact diagnosis is imperative both from the point of view of prognosis and of treatment.

4. That tuberculous disease of the middle ear and accessory cavities is a frequent disease amongst infants and young children.

5. That the disease is most frequently found as secondary to tuberculous processes in other regions of the body.

6. That primary tuberculous disease of the middle ear is probably of more frequent occurrence than is usually supposed.

7. That the prognosis is always grave, but that in a certain proportion of cases suitably planned surgical intervention will eradicate the disease.

8. That in many cases it is advisable to conduct the operative treatment "in stages."

9. That when less than 10 per cent. of hearing-power remains no attempt should be made to preserve the organ as an organ of special sense.

10. That when more than 10 per cent. of hearing-power remains in a patient in otherwise apparent health, a definite attempt should be made to preserve what amount of hearing-power still exists.

11. That where the tuberculous origin of the disease has been scientifically demonstrated the case should be regarded as infectious, and precautions taken accordingly.

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The PRESIDENT thought the Society was to be congratulated on having three such important and well-worked-out papers, and he felt certain that a large number of the members present were anxious to discuss the matter; therefore he would confine himself to a very few remarks. He remarked specially upon a very important case which had been recorded in which the tubercle bacillus was found in a non-suppurative case of middle-ear disease. He did not gather what was found besides the tubercle bacillus. With regard to Dr. JOBSON HORNE'S valuable contribution, he could not help being struck by the author's poetic turn of mind with regard to the development of an anæsthetic alcohol. It was a very

pretty theory, but somewhat poetical. It did not quite get rid of the chief cause of the pain in such cases being pressure on nerve endings. In tuberculous cases there was not very acute inflammation, not very great pressure, and therefore absence of acute pain. He had been especially interested in Dr. MILLIGAN'S paper, and particularly that part which insisted on the importance of adenoids which were infected by the tubercle bacillus. The question of facial paralysis in association with operation was of importance. In reference to sending the cases to the seaside, there was a very great tendency in that direction in England, but in Germany that course was advised against. At first he did not see the reason of that, but it was no doubt due to the fact that the South Coast watering-places were selected in England, which were warm, whereas the watering-places in Germany were of northerly aspect, and therefore unsuitable for patients. He agreed with Dr. MILLIGAN on the question of operating on the tubercular cases. In selecting cases for operation he thought the important point was, not the amount of local damage, but the general condition of the patient; there might be extensive local damage, and yet it would be worth while operating if the patient was in good condition. He would never forget operating in the case of a baby fifteen months old with a large number of enlarged glands. On cutting down, the whole of the mastoid process was found to be green, and it was necessary to expose a very large surface of the dura mater, and there was necrosis leading into the middle ear. Yet the patient never had a bad symptom afterwards. He mopped out the whole of the cavity with pure carbolic acid when he thought he had cleared out the diseased bone, and the healing was complete in about a month.

Mr. C. A. BALLANCE said it appeared to him that, in order to adequately discuss the papers which had been read, it was necessary to be an expert bacteriologist, an expert pathologist, and an expert surgeon, and he did not feel equal to discussing about twenty different phases of the question at the same time. He thought tuberculosis of the temporal

bone region should be treated and thought of, both pathologically and by the surgeon, exactly as tuberculosis of any other bone was, and, so far as one was able to carry out operative measures in accordance with that view, was one likely to be most successful. Dr. MILLIGAN recommended in his paper that operation should be done by stages where the disease was extensive. He (Mr. BALLANCE) had frequently done that in young children, not only in cases of tuberculosis of the temporal bone, but in severe tuberculosis in other parts of the body. For instance, he had excised the knee-joint by three or four operations with success, when, if he had attempted to do it by one operation, the result would have been the death of the child. The same plan should be carried out in cases of extensive necrosis, which was so common in caries of tubercular origin in children in the temporal bone. There had been some discussion as to the temporal bone being the primary seat of the disease, or a secondary centre of disease. He believed that in a considerable number of cases the temporal bone was the seat of the primary disease, and it was those cases which were especially important to surgeons, because, if the primary focus were entirely ablated, the patient was very likely to be able to deal with the secondary focus. Most surgeons must have amputated a thigh for tuberculous disease of the knee in cases of phthisis, and with great benefit to the disease in the lung. He was sure he had ablated extensive tubercular disease in the temporal bone with great benefit to the lung. If one tried to carry out the ordinary principles of surgery in dealing with temporal bone disease, that was the direction in which advance would be made. He believed Dr. JOBSON HORNE suggested that the glands at the periphery should be removed and the primary disease left. (Dr. HORNE: I only advocated removal of the glands at the first operation.) Mr. BALLANCE said he believed in removing both, by stages, where necessary. The glands should be removed quite as surely as the primary disease in the temporal bone. He referred to two remarkable cases in which tubercular disease of the temporal bone was successfully treated, in both of

which cases surgeons had removed in previous years glands from the neck which were tubercular. One was a patient who had been under the care of Mr. CUMBERBATCH and Mr. PEARCE GOULD, and several times had had glands removed from the neck and from the axilla on the same side. There had been a slight watery discharge from the ear, and not much had been thought of it. Suddenly the patient had headache and facial paralysis. On opening the mastoid and doing the radical mastoid operation, the whole bone, exclusive of the cortical part, was found to be changed into tubercular tissue. So the removal of the secondary disease in the neck was of no use in dealing with the primary disease in the temporal bone. In that case the diseased parts were sent to Mr. Shattock, at the College of Surgeons, and he pronounced them to be tuberculous. At the present time that patient was perfectly well. The bone wound was grafted. In the second case he would mention the patient was a boy aged eleven, who also had had cervical glands removed, and from both sides of the neck. For four years he had had a slight watery discharge from one ear, with occasional headaches. He went over to Paris for his holiday, and while there had a severe attack of headache and vomiting, and there was afterwards paralysis of the external rectus of the eye on the side of the disease. On his return to London he was seen by Mr. BALLANCE, and he then had had similar attacks for a fortnight. After consultation it was decided to open up the mastoid, and on doing so, as in the other case, the bone was found to be entirely replaced by tuberculous tissue, yet there had been no external sign of extensive disease. The focus was removed, and in four months the paralysis of the external rectus had disappeared, the headache had ceased, and there was no further vomiting. Thus in the one case there was extensive tubercle, in which glands had been removed previously without doing the patient permanent good, and in the other case there was disease of the temporal bone which had infected the meninges of the brain with tubercle, and in which the removal of the primary disease allowed the cells of the body to deal with

the tubercular infection. He believed the boy would have soon died if the disease of the temporal bone had not been immediately treated by operation. He felt sure it was the primary source of the disease which it was the surgeon's duty to attack at the earliest possible moment, and that it should be removed completely, if necessary, without regard to the occurrence of facial palsy or loss of the hearing-power.

Mr. CUMBERBATCH said the subject had been so exhaustively treated by the several gentlemen who had read papers that it was difficult to add anything without reflection. But he would endorse what Mr. BALLANCE had said. He would treat such cases entirely on their merits. It should not be a question of operating upon them or leaving them simply because they were tuberculous. The question was whether it was possible to remove the disease. If so, it should be done.

Dr. A. L. WHITEHEAD said he had recently examined a series of records of fatal cases which occurred in the clinique to which he was attached. Of the last hundred cases there were only twelve which were distinctly tuberculous, and of those all but three were under two years of age. Of the three over that age all had advanced tuberculous mischief elsewhere, chiefly in the lungs. Of the nine cases under two years of age, in only one was there another focus of infection —*i.e.*, in eight of the cases, apparently, disease in the temporal bone was the primary source of the trouble. Two of the eight died, apparently from miliary tubercles on the meninges only. In six, or 50 per cent., there was general miliary tuberculosis. A few rough conclusions could be drawn from those figures. When the cases proved fatal they generally did so by general dissemination, and not by any local extension; therefore, if they could be treated early the ultimate prospect was likely to be very good. The difficulty lay in the early recognition of such cases and their prompt treatment. He suggested that in the case of infants, where there was nothing like chronic painless otorrhœa with wasting or enlargement of the cervical glands, or any evening rise of temperature, an exploratory operation should be performed

on the mastoid. He thought that could be carried out practically without any danger to the child. If that were done there would be fewer cases of extensive disease in that region, and the disease would have been attacked before there was any risk of general dissemination of tubercle.

Mr. HUGH JONES referred to a paper in the current number of the *British Medical Journal*, by Dr. Nathan Raw, on the subject of human and bovine tuberculosis, which might have some bearing on the question under discussion. Out of 1700 cases of phthisis which the author had under his care, only a certain small number of them had primary joint or glandular trouble. On the other hand, Dr. Raw pointed out that primary tuberculosis of joint and bones was enormously on the increase, and he made out the point that bovine tuberculosis was really accountable for the primary bone and joint affections. It was worthy of consideration whether it might not also be responsible for the primary mastoid affections. On the other hand, Dr. Raw held that lung tuberculosis was really a human variety, and not transmissible from the cow. The paper in question was only a preliminary note, but it should make one alive to the question of the milk-supply.

Mr. A. CHEATLE said he did not hear the whole of Dr. WINGRAVE'S paper, but in it he spoke of squames. In diseases of the skin squames were looked upon as evidence of simple chronic dermatitis, and of no pathological importance, and it might be that in the ear a profuse and prolonged discharge from the middle ear would produce such squames. Certainly squames acted as a nidus for micro-organisms. He had also been struck by the smell of such cases, but he did not think that had been mentioned before. Many times in young children with profuse discharge from the ear which was suspected to be tuberculous the smell had been characteristic. He (Mr. CHEATLE) agreed with the PRESIDENT that painlessness of tubercle in the middle ear was due to the fact that there was no tension, not much inflammation, and therefore little pressure on the nerve endings; that was quite sufficient to explain the comparative absence of pain. Dr. JOBSON HORNE spoke of tubercle of

the temporal bone as bone tuberculosis, but the process often started in the lining membrane itself. He had shown before the Society a specimen in which the tubercle was entirely limited to the lining membrane, the bone not being affected in any way, Two very interesting cases of tubercle in adults had occurred in his (Mr. CHEATLE'S) practice, in which he was able so strongly to suspect tubercle that examination of the chest at once revealed it. One was that of a young man who complained of the classical symptoms of discomfort in his ear, deafness, slight noise, but no pain. The membrane itself was swollen rather than bulging, and was dull red in colour. On examining his lungs, fine crepitations were heard, but no suspicion of a cavity. Within a week of the examination he had a profuse hæmoptysis, from which he nearly died. The middle ear was treated on antiseptic principles, and to the best of his (Mr. CHEATLE'S) recollection the middle ear healed up with very thick adhesions. Recently a man attended at King's College Hospital with deafness and discomfort, and had the same condition of membrane. Examination of the lungs again revealed tubercle, and the pus from the middle ear showed bacilli which were indistinguishable from tubercle bacilli. How were such cases of tubercle in the lining membrane beginning secondarily to disease of the lung to be treated? In his opinion the best way to treat them was antiseptically, being particularly careful about purification, laying them open to allow of discharge if there was any retention, and prevent reinfection, which was one of the most important points, and then send the patient away to have the open-air treatment. He did not agree with the idea that such cases of tubercle in adults pointed to the beginning of the end; at any rate, they were not necessarily on their death-bed. He found it difficult to agree with Dr. MILLIGAN in thinking that it was common to have caseous deposits in the mastoid process which did not cause any trouble until the coccal infection set the whole thing alight. That he regarded as unscientific. He did not see how a tuberculous infection was likely to exist in the bone without setting up some symptoms, and, in the absence of better

proof he would be inclined to reject such a conclusion. There were cases in which hæmorrhage occurred. He had seen very few cases of severe hæmorrhage following tubercle. But there was one under the PRESIDENT'S care in King's College Hospital in which a child dying of acute tuberculosis had profuse venous hæmorrhage from the ear. That child died from miliary tuberculosis.

TWELFTH ORDINARY MEETING.

Monday, March 2, 1903.

The PRESIDENT, Professor URBAN PRITCHARD, IN THE CHAIR.

The following gentlemen were elected Members of the Society:

JAMES DONELAN, JAMES KERR, HAROLD FREDERICK MOLE, THOMAS HENRY PINDER, CYRIL GEORGE REISS WOOD.

The following gentlemen were nominated for election at the next meeting:

CHARLES GEORGE LEE, M.R.C.S., L.R.C.P., 11 Princes Avenue, Liverpool.

JAMES GALBRAITH CONNAL, M.B., C.M. (Glasgow), F.F.P.S., 4 Burnbank Terrace, Glasgow.

ADJOURNED DISCUSSION ON "TUBERCULOSIS OF THE EAR."

Mr. LAKE said that one point that struck him in the papers was the question of granulations. In certain post-influenzal disease of the mastoid one found there was a condition which was extremely like tuberculosis of the bone or antral cavity. He had operated upon such a case at the Royal Ear Hospital, where the granulations were in a large mastoid cell. Judging from the naked-eye appearances, he thought that it was a case of tubercle, but the guinea-pig experimented on took the advantage of dying of something else, and there was absolutely no sign of tubercle. With regard to primary tuberculosis of the middle ear, Mr. CHEATLE had spoken of cases in which the membrane was of a dark-red colour. In

the cases which he had seen, and in one of which he had found bacilli, the colour of the membrane was relatively a pale pink, with large vessels coursing over it. The larynx became infected, but the pus which came down the Eustachian tube seemed not to infect the naso-pharynx. With regard to tuberculous disease of the antrum and the cells, there were cases in which it might be primary or secondary. In these cases he did not see that the bacillus could help them from a clinical point of view. When they opened the antrum a diagnosis had to be made. In a case in which tubercle was not suspected one was not so radical, and did not cut away more than was necessary. He had rather a peculiar case lately, which was one of secondary infection, and a chronic case which, there was no doubt to his mind, was tuberculous. In the former case, facial paralysis came on a week after the operation, and had remained ever since. When the face paralysis came on he was very anxious and not quite certain but that there were further extensions of the mischief. The patient had, however, entirely recovered. As to cases of tubercle of the middle ear which came on during pulmonary tuberculosis, he thought that they must be much less common in this country than on the Continent. He operated on one patient suffering from pulmonary tuberculosis and mastoid trouble, who did extremely well, and perfect healing was arrived at. He did not think that he would graft in any of the tuberculous cases. It seemed to him that if there was a chance of getting rid of the disease at all it was rather a bad thing to graft, because one might shut in a little bit of tuberculous granulation tissue.

Dr. DUNDAS GRANT said that the discussion had been of great value, and led one to inquire in every case of suppuration of the middle ear whether the case was one of tuberculosis or not. A considerable number of years ago Bezold pointed out the peculiar features of acute tuberculous disease of the middle ear and membrane—namely, the occurrence of discharge, and a considerable amount of deafness without pain. He (Dr. DUNDAS GRANT) had under his observation in 1901 a case in

which these features were particularly striking. There were two perforations. The patient was a healthy-looking farmer, and apart from the appearance of the tympanic membrane, he should not have suspected the disease to be tuberculous in its nature; but the patient, on inquiry, told him that, so far from being robust, he had been sent to South Africa on account of tuberculosis of one of his lungs. There was no tendency to tuberculosis in the family, but the patient had been on terms of intimacy with a young woman who was in an advanced stage of consumption. The case appeared to be one of actual infection from one person to another. A couple of months later the membrane was almost entirely gone. The case then disappeared from his observation.

It was very important not to run away with the idea that every case which presented a sudden discharge not preceded by pain was tuberculosis. He was convinced that many cases were not so, and that in them there had been previous disease of the middle ear, perhaps forgotten, leaving a perforation or such a thin cicatrix that it ruptured without there having been sufficient tension to cause pain.

Dr. WINGRAVE had quoted one of his (Dr. DUNDAS GRANT'S) cases—that of a tuberculous man who appeared to have acute inflammation in the middle ear with deafness, but without pain, and in which the membrane was of a dull yellowish tint, with numerous vessels radiating over it, very much as Mr. LAKE had described. It gave the impression of there being cheesy matter in the interior of the tympanum. In that case Dr. WINGRAVE found abundance of bacilli.

The question of operation was, of course, one of vital importance. Operating by stages was a method which would appeal to many temperaments, and in many cases one seemed naturally to fall into this method, opening, in the first place, the abscess over the bone, and then afterwards endeavouring to eliminate the disease by a further operation. It might be remembered that at the International Otological Congress Professor Politzer expressed a view which seemed to commend itself. It was that if suppurative otitis occurred in the course of tubercular phthisis it was undesirable to operate;

but, on the other hand, if pulmonary phthisis came on in an individual who was at the time suffering from chronic suppuration or tuberculosis of the middle ear, then the operation on the ear was strongly called for. Mr. BALLANCE seemed to have found advantage accrue in the case of patients with tuberculous phthisis from an operation on the ear and the cavities, even in the presence of advanced pulmonary phthisis. That went to some extent in the face of what Professor Politzer had advised. The subject was one which was therefore open to further consideration. It was to be hoped that from time to time evidence with regard to it would come before the Society, now that the machinery had been set rolling in such a very vigorous and gratifying matter.

Mr. C. H. FAGGE said that he should like to have the opinion of the writers of the papers as to the pathological nature of the large sequestra. Attention had been drawn to the early involvement of the auditory canal in tubercular disease of the labyrinth. He thought that it naturally followed that many of the large sequestra which had been brought before the Society, and one of which he had shown, were almost certainly tuberculous.

Dr. WYATT WINGRAVE, in replying, said he thought that the difficulty in demonstrating the tubercle bacilli was often due to the thoroughness in the local treatment. The explanation of acid-fast property was very obscure at present, and we must not accept too hastily Aronson's or any other interpretations. For if any bacilli acquired their acid-fast qualities from local influences, such as the presence of cerumen, many acid-fast bacilli were obtained from regions remote from such an influence. Probably the chemical causes were many, since he had found bacilli that were acid-fast, but not alcohol-fast, in discharges which had been taken from the deepest available regions as well as from the meatus, especially the latter. The acid-fast property of squames was, he felt, due to intrinsic rather than to extrinsic changes, since it occurred in all old cells of epidermal origin, and was not peculiar to aural discharges. He suggested keratin as being the responsible substance, but did not overlook that both fat and

wax were epidermal products. If the acid-fast quality were of extrinsic origin, why should some bacteria be influenced and not others? He had examined many adenoids, but had failed to find tuberculous lesions in them in more than about 1 per cent. of suspected cases. Tubercle bacilli were present in greater proportion, but on the surface only, and unattended by any "giant cell" or granulomatous changes. That bacillary infection might be *viâ* the Eustachian tube he considered was strongly supported by Case 50 in his table, that of a man suffering with chronic non-suppurative middle-ear catarrh and pulmonary phthisis, whose right tympanic membrane was punctured by Dr. DUNDAS GRANT, evacuating caseous matter containing tubercle bacilli and diplococci. The extensive latent mastoid necrosis in children alluded to is not surprising owing to the late development of the air-cells, the apneumatic tissue remaining soft till very late except a superficial ossified crust. The special tendency of the stapes to tuberculosis in children may be associated with its peculiar development around the disappearing stapedial artery and its later ossification than the other ossicles. With regard to cerebral abscesses in tuberculous cases, he had examined the contents of four and found tubercle bacilli in one only (Case No. 74). The bacteria present are generally streptococcal. He did not think that adult aural tuberculosis was quite so uncommon as Dr. MILLIGAN did, since the table shows ten cases of true tuberculosis between the ages of fifteen and thirty-eight, and only two at three and a half and four years respectively; but he fully agreed with him as to the important rôle which mixed infection played in the morbid changes. The excellent result of constitutional treatment combined with careful attention to local changes was well shown in Case 15, that of a young woman, who not only suffered with general tuberculosis, but had suppurative discharge containing tubercle bacilli for five years. She was now fat and strong, with no discharge for two years, although blind from optic neuritis. In reply to the PRESIDENT'S remarks, Dr. WINGRAVE said that the other bacteria found were diplococci, whose nature was not defined owing to absence of

cultivation tests. In reply to Mr. CHEATLE, the points which Dr. WINGRAVE wished to emphasise with regard to the presence of acid-fast "squames" were that when present in large numbers they indicated the existence of cholesteatomatous changes, if taken from the deepest available region, and not merely from the meatus; that their fragments might by the inexperienced be mistaken for tubercle bacilli, and their acid-resisting property might probably be of the same nature as that of the bacillus of tubercle.

Dr. JOBSON HORNE, replying, thanked the members for the kind way in which they had received his paper. He said it had been gratifying to him that the paper had provoked so much discussion. It was written for the purpose of doing so. The PRESIDENT had not very readily accepted his views with regard to the absence of pain, and Mr. CHEATLE had taken the same view as the PRESIDENT, namely, that the absence of tension accounted for the absence of pain. He (Dr. JOBSON HORNE) could not think that that was a sufficient explanation, and he still adhered to the view which he put forward that for an explanation they must look to the chemical part played by micro-organisms with regard to pain, or, rather, the absence of pain, and especially in connection with tuberculous disease. The next speaker was Mr. BALLANCE, and he quoted two very interesting cases which really supported a view which the paper advanced, that in primary tuberculous disease of the temporal bone it was better to operate in stages and upon the glands first, the intention being to localise the primary lesion in the bone. When the lesion became localised it was easier to deal subsequently with the bone with a view to its entire removal. Dr. WHITEHEAD had quoted some interesting results of his valuable search into the post-mortem records of his hospital. These agreed with Dr. JOBSON HORNE'S own experience, which went to show that the primary cases occurred more commonly in childhood, and that death was commonly due to meningitis. Mr. HUGH JONES referred to Dr. Nathan Raw's paper, which recently appeared in the *British Medical Journal*, in which he suggested that certain forms of tubercu-

losis met with in the human subject, more especially bone tuberculosis, might be attributed to bovine tuberculosis. He (Dr. JOBSON HORNE) had carefully avoided the subject because it was so very wide; but he must say, in reply to Mr. HUGH JONES, that at present he saw no reason for departing from the view which he had always held, and the one which he believed would be generally recognised eventually, that in tuberculosis the real source of danger to mankind was man. Mr. CHEATLE touched on several points, and remarked that he was struck by the smell in tuberculous cases, which was at times very noticeable. Dr. MILLIGAN had told them that between 50 and 60 per cent. of the cases of suppuration of the middle-ear amongst children were due to tubercle. So if any diagnostic significance were to be attached to the odour of the discharge, one would have expected a reference to tuberculosis in Mr. CHEATLE'S very able report upon ear disease in school-children. With regard to the question that had been raised by Dr. WINGRAVE about the "acid-fast" property, Dr. JOBSON HORNE thought that although it might not be right to attribute the acid-fast property entirely to the wax, nevertheless the wax was the most important factor in it.

Dr. MILLIGAN thanked the members of the Society for the patient way in which they had listened to his contribution to the subject under discussion. He was painfully conscious that his paper was unduly long, but, at the same time, he felt that the importance of the subject demanded a fairly full statement. Most of the points that had been raised in the discussion had already been replied to by the two previous speakers. The PRESIDENT had raised the question of the relation of tuberculous adenoids to tuberculous disease of the middle ear. Dr. WINGRAVE had also referred to this in his remarks, and had stated that the number of tuberculous adenoids which he had met with in practice was only 1 per cent. The statistics which he (Dr. MILLIGAN) gave, including Dr. WINGRAVE'S statistics, varied from 1 to 20 per cent. He did not wish to say that all tubercular adenoid vegetations in which tubercular bacilli were found were actually tubercular, as it had been demonstrated long ago

that bacilli could pass through an intact mucous membrane, and it was quite possible that at the time of investigation bacilli might be passing through the vegetations, on their way, as it were, towards distant organs. With regard to the question of sending patients to the seaside, he agreed in general with the views expressed by the PRESIDENT. Where the climate was warm and mild, good results were obtained, but where, on the other hand, it was bleak and windy, he considered it to be detrimental to the welfare of the patient. He had already expressed his views upon the subject of operation, and would refer members to the conclusions arrived at in his paper, especially those numbered nine and ten. He was distinctly of opinion that prolonged operations in tubercular cases occurring in young children were inadvisable. He fully shared Mr. BALLANCE'S views that these cases should be treated upon general surgical principles. One good point which the discussion had brought out was that primary tuberculous disease of the middle ear was more frequent than would appear from literature, and after recognising that this was so they would grasp the fact that early surgical interference, in order to eliminate the primary focus of disease, was of importance. However extensive the local disease might be, if the patient's general condition was good, operation should be undertaken. On the other hand, where the patient was exhausted and debilitated the chances were decidedly against him. Mr. WHITEHEAD referred to an analysis of cases from the hospital to which he was attached. He did not, however, mention the ages of the patients, which was a grave omission, as it was not possible to discuss the question unless one knew the ages at which the disease was found. He did not agree with Mr. CHEATLE about the latency of tubercle within the mastoid. He thought that there was no reason why a tubercular process might not remain latent within the mastoid cells, and only become stirred up into activity as the result of some grafted infection or injury. Nor did he agree with Mr. LAKE about the finding of the bacilli. It was his opinion that the finding of bacilli was necessary from the point of view of diagnosis, and had

an enormous importance in relation to the question of prognosis. He could not follow Mr. LAKE'S objection to grafting in such cases. Provided the tubercular disease had been eradicated, he failed to see why these cases should not be grafted. On the other hand, it was, of course, no use grafting if any tubercular focus was left. In reply to Mr. FAGGE'S question about the occurrence of sequestra, he begged to say that he had already referred to this subject in his paper. His experience was that sequestra were very frequently met with in tuberculous cases. In reply to Dr. WINGRAVE'S question about the destruction of the stapedio-vestibular joint, his belief as to the reason why it was so seldom destroyed in pathogenic infections was that it received a double blood-supply, partly from the middle ear, partly from the labyrinth. In tuberculous cases, on the other hand, where frequently both the middle ear and the labyrinth were involved, the nutrition to the part was not so good, and hence the tendency to disintegration. In conclusion, he was glad that the subject of tuberculous disease of the middle ear had been ventilated, and hoped that the discussion would stimulate inquiry into the relative frequency of these tubercular cases.

A case of secondary tuberculosis of the middle ear.

By ARTHUR H. CHEATLE.

H. R., *æt.* 50. Wife died short time ago of consumption. Came to hospital May 29, 1902. Deafness, discomfort, and slight discharge from left ear for three weeks. Swelling and dull redness of posterior and inferior segments of drum, with slight watery discharge. Perforation could not be precisely located. Tuberculosis of left lung with tubercle bacilli in sputum. Later the redness and swelling diminished, showing a pin-head perforation with thick red edges in inferior segment. Discharge became more purulent and pulsated. Bacilli indistinguishable from tubercle found in the discharge. Patient lost flesh. The discharge had ceased and the membrane healed with marked diminution of hearing under antiseptic cleansing, with general tonics and cod-liver oil.

Two specimens of tuberculous disease of the temporal bone.

By C. H. FAGGE.

(1) Temporal bone, *vide Otolog. Soc. Trans.*, vol. iii., p. 17.
(2) Sequestrum removed from case of tuberculous otitis.

Specimens and microphotographs illustrating tuberculous disease of the ear and naso-pharynx.

By W. MILLIGAN.

(1) Temporal bone with perforation of the tegmen tympani, the result of tuberculous disease of the middle ear; death from septic pia-arachnitis.

(2) A microscopic section, showing bacilli in pus, obtained from a periotic glandular abscess.

(3) Microscopic section of a tuberculous gland, secondary to tuberculous middle-ear disease, showing caseous and fatty degeneration.

(4) Microphotograph showing tuberculous disease of posterior surface of uvula.

(5) Microphotograph of tuberculous granulation from middle ear.

Specimens of tuberculosis of the temporal bone.

By ARTHUR H. CHEATLE.

(1) Right temporal bone of an infant who died of general tuberculosis. A perforation in the posterior segment of the membrane. The lining membrane as seen through was thick and nodular. The ossicles were intact. The middle ear, including the antrum, was full of cheesy pus. Sections of the lining membrane stripped off from the external semicircular canal showed tuberculosis. This specimen and section were shown at the Society's meeting, February 4, 1901. The section was referred to the Pathological Committee.

(2) Right temporal bone of an infant who died of general tuberculosis. The antrum was opened during life and caries of tegmen found. The bone round operation limit showed great extension of the disease, being white and porous. There was a large gap into the middle fossa; the exposed dura mater showed tuberculosis on section. The Fallopian canal was opened by the disease, and the nerve was destroyed. The promontory was rough and carious; both fenestra were irregularly enlarged, and the labyrinth was invaded. The external semicircular canal was opened by the disease.

(3) Left temporal bone of a child who died of general tuberculosis. Complete loss of membrane. The handle, short process, and neck of malleus were destroyed, also the descending process of the incus. The promontory was carious above the round window. The stapes was in position. The tympanic plate was white and carious. The middle-ear cavities were full of brown pus.

Temporal bones removed from patients who died of tuberculous meningitis.

By ARTHUR H. CHEATLE.

(4) Right temporal bone of an infant who died of tuberculous meningitis. The membrane was intact and bulging. The middle-ear cavities were full of pus. The petro-squamosal sinus was well developed, and had a patent opening into the lateral sinus. The tuberculous nature of the middle-ear trouble was not established.

(5) Right temporal bone of a child aged two years and seven months who died of tuberculous meningitis. Small perforation behind tip of handle of the malleus. The lining membrane was thick. Middle-ear cavities were full of pus. The petro-squamosal sinus was well developed. The tuberculous nature of the middle-ear trouble was not established.

(6) Left temporal bone of an infant aged four months who died of tuberculous meningitis. Membrane intact. Middle-ear cavities full of pus. Petro-squamosal sinus well de-

veloped. Tuberculous nature of pus in tympanum was not established.

(7) Right temporal bone of an infant aged one month who died of tuberculous meningitis. Small perforation in Shrapnell's membrane. Middle-ear cavities full of pus. Petro-squamosal sinus was well developed. Lining membrane of the middle-ear was thickened. Sections of the lining membrane showed small-celled infiltration of the superficial layers, and destruction in patches of the epithelium. No tubercle.

A case illustrating tuberculous disease of the nasal cavities.

By HERBERT TILLEY.

Patient was operated upon five years ago for tuberculous ulceration of the internal surface of the right alæ nasi and anterior end of right inferior turbinal. Well-marked contraction with some loss of substance of right alæ nasi resulted. The tuberculous nature of ulceration was established by microscopic examination.

November 1902, patient was readmitted to hospital for obstruction in the left nasal cavity. A swelling consisting of pale granulation tissue was seen occupying a part of the lower region of the cartilage of septum. This was thoroughly curetted and trichloracetic acid was rubbed in. The tuberculous nature of the granulation tissue was verified by microscope.

Primary tuberculosis of the ear. The specimen from a case of general miliary tuberculosis with primary focus in the temporal bone.

By W. JOBSON HORNE.

The child, aged thirteen months, had been wasting for seven months, and had had a cough of three months' duration. No aural symptoms had been mentioned, nor had

there been evidence of pain in the ear, but there was facial paralysis on the right side, and it was elicited that there had been a discharge from the right ear for about four months.

The post-mortem examination revealed a subperiosteal abscess lying over a well-defined area of necrosed bone, immediately above and behind the right external auditory meatus.

The tuberculous nature of the disease of the ear was definitely established by tubercle bacilli being found in the tissues covering the necrosed bone.

There was very extensive disease of the lymphatic glands, general miliary tuberculosis, tuberculous meningitis with tuberculous nodules in the brain, all of these lesions being more recent than that in the temporal bone.

A case which was shown on February 5, 1900, *as an adeno-carcinoma, probably in reality an endothelioma, with section.*

By ARTHUR H. CHEATLE.

Since showing the patient, the growth has continued to spread locally, invading the skull. The growth had been exceedingly slow, and there had not been any involvement of glands. Facial paralysis was now present. Patient was now in the Cancer Wing of the Middlesex Hospital. Since she had been there she had had general convulsions once. It was seven years since the first note of the growth.

Mr. CHEATLE said with regard to this case that he would be very glad for the section to go to the Pathological Committee.

With regard to another case, possibly an endothelioma of the ear, which he showed last December, it would be remembered that it was that of a lady who had a tumour in the abdomen. Dr. HERBERT SPENCER thought that it was malignant, and said that he would not touch it except after further examination. In a few months' time it was found that the lumps had not increased in size, but, on the other

hand, the main tumour had grown. Dr. HERBERT SPENCER then altered his opinion, and thought that it was right to operate, which he did, and removed a very large ovarian cyst. The ovary itself, or some part of it, was kept for microscopical sections. He did not think that it was at all malignant. Dr. JOBSON HORNE had stated last December that he did not think the tumour of the ear was secondary to the abdominal symptoms, and certainly it was not.

The section was referred to the Pathological Committee.

Dr. JAMES KERR LOVE exhibited *stereograms of sections of the temporal bone.*

THIRTEENTH ORDINARY MEETING.

HELD AT THE MEDICAL INSTITUTION, LIVERPOOL.

Saturday, May 2, 1903.

MR. CHARLES A. BALLANCE, VICE-PRESIDENT,
IN THE CHAIR.

The following gentlemen were elected Members of the Society:—JAMES GALBRAITH CONNAL, CHARLES GEORGE LEE.

The development and morphology of the ear.

By A. M. PATERSON.

While there is no organ in the body more complex in its development and structure, there is none which illustrates more forcibly the process of evolution from simpler to more complicated forms.

Three natural groups may be made of the cranial nerves: (1) motor and myotomic—the third, fourth, sixth, and twelfth; (2) branchial—the fifth, seventh, ninth, tenth, and eleventh; and (3) those associated with the sense organs of smell, sight, and hearing.

Without going into any comparison of the nerves in question, it is noteworthy that all the sense organs with which they are connected have certain fundamental characters in common. The nasal, optic, and auditory organs arise to begin with as epiblastic involutions from the surface of the head: each becomes secondarily connected with the buccal cavity, by means of a cleft, pre-oval or branchial; and each gets an investment of mesoblast, forming a capsule, cartilaginous or fibrous.

Beyond these features in common, each organ proceeds in its own way to attain its mature condition.

The auditory organ arises as an invagination of the surface epiblast in series with the nasal pit and the lens; it is situated behind the position of the mouth, and dorsal to the first post-oral visceral cleft.

In Elasmobranchs the vesicle is permanently in relation with the surface by means of a ductus endo-lymphaticus, which is in direct communication with sea water. In other vertebrates the vesicle becomes quite separated, and the duct ends blind as the saccus endo-lymphaticus.

This epiblastic vesicle becomes immediately connected with the ganglionic outgrowth from the hind brain which produces the auditory nerve with its vestibular and cochlear subdivisions; and it is further differentiated into the parts which constitute the membranous labyrinth—saccule and cochlea, utricle and semicircular canals. The saccule and utricle being connected together by the ductus endo-lymphaticus.

There are three semicircular canals in all vertebrates except Cyclostimi. In Myxine the labyrinth is simple and tubular. In the Lamprey only two canals occur.

The cochlea is rudimentary in fishes, more elongated but simple in character in reptiles and birds; it is only in mammals that it is spirally wound round the cochlear nerve, and among mammals its extent varies. In the rabbit as in man the cochlea has $2\frac{1}{2}$ turns; in the ox $3\frac{1}{2}$ turns; and in the pig 4 turns round the cochlear nerve.

The next occurrence in the formation of the organ is the enclosure of the auditory vesicle and its nerve in a mesoblastic capsule; in the case of the nasal and auditory organs, a capsule which is incorporated with the skeleton of the head and is developed in cartilage; in the case of the eye, a fibro-vascular capsule which is unattached to the cranial skeleton.

The otic capsule occurs throughout vertebrates. It acquires important connections with contiguous portions of the cranial skeleton, and in man produces the petro-mastoid bone.

It assists in forming the base of the skull by its inclusion between the exoccipital and alisphenoid outgrowths of the parachordal and trabecular cartilages. It is overlapped and eventually fused with the membranous vault of the skull, out of which is produced the squamo-zygomatic bone, and the union of these two elements produces the mastoid antrum.

In relation to the contained auditory vesicle, the capsule in its growth shrinks from the membranous labyrinth, so as to lead to the formation of the perilymphatic space, which is in communication with the pericranial lymphatics by means of the aqueduct of the cochlea.

In fishes the above process represents the permanent stage of development of the ear, and sound is conveyed directly from and through the otic capsule to the auditory labyrinth.

The next step in the development of the organ occurs by the formation of a fenestra oralis, and a stapes which may be associated with a columella reaching to the surface of the head and connected with a membrana tympani. In amphibia the stapes first appears. In the Anura the base of the stapes is found, in cryptobranches the columella occurs, and the fully formed stapes and columella are present in reptiles and birds.

The tympanic cavity and Eustachian tube are essentially associated with the appearance of the ossicles. The stapes is developed as a special ossification round the stapedial artery, and is not related to the gill arches; it is found in the mesoblastic tissue intervening between the otic capsule and the surface of the head.

The tympanic cavity is produced by the absorption of the mesoblastic tissue between the capsule and the surface, leading *pari passu* to the formation of the Eustachian tube and membrana tympani.

This is the second stage in the development and evolution of the ear, as represented in reptiles and birds.

The mammalian ear has already been noted as differentiated by the possession of a spiral cochlea. It is also characterised by important differences in the more external parts of the organ.

The tympanic ossicles are three in number. Added to the stapes are malleus and nicus, the derivatives respectively of the articular and fundrate elements of the cartilage (Meckel's Cartilage) of the mandibular arch.

This is the first indication of the share of the branchial apparatus in the construction of the ear, and it is somewhat remarkable, as in mammals the branchial arches and clefts are subordinate and in a sense rudimentary. None of the clefts is pervious; and the first cleft, and the first two branchial arches, mandibular and hyoid, are secondarily connected with the formation of the ear.

The cartilage of the first arch is essentially related to the formation of the lower jaw, and its proximal end imbedded close to the base of the skull between the otic capsule and the surface gives rise to the malleus anduicus, which are at first surrounded by embryonic mesoblastic tissue. As this becomes absorbed and swept away, the tympanic cavity is produced as already indicated.

The first branchial cleft impervious in mammals produces at its dorsal end the membrana tympani, lined externally by epiblast and internally, after the formation of the tympanic cavity, by hypoblast.

The mammalian ear is further characterised by the possession of an external auditory meatus and a prima; the former produced out of the superadded tympanic ring and by the growth of the deeper part of the prima itself; the latter formed through the agency of the first and second branchial arches by the growth of confluent knobs or elevations surrounding the tympanic membrane.

The process of development thus very forcibly illustrates the line of evolution of the ear.

There is first an invagination of the surface epiblast, connected with the brain, and communicating with the surface (Elasmobranchs). Then a complete severance of connection with the surface (bony fishes); then the formation of tympanic cavity, membrana tympani, stapes and columella in addition (reptiles and birds); then the addition of branchial elements, malleus and incus, external meatus, and prima (mammals);

and its complexities (and interest) are still further increased by the occurrence of mastoid antrum, mastoid process and cells.

There are many obscure and interesting questions associated with the morphology of the ear. The spiral cochlea of mammals is a puzzle, although the curling of the tube may be only a mechanical arrangement for saving room. Another point that is obvious in the study of the subject is the quite secondary share taken in the formation of the ear by the branchial apparatus. Only in mammals are the branchial arches and first cleft concerned in its formation; and in mammals the association, although essentially important in the construction of the organs, is secondary both in time and order of evolution to the formation of the labyrinth and otic capsule.

Mr. C. H. FAGGE had listened to Professor PATERSON'S paper with much interest and instruction; he had always regarded the antro-tympanic cavity as derived from the internal cleft depression of the first branchial cleft, whereas Professor PATERSON suggested a modification of this view, deriving the middle ear from a vacuolation of the mesoblast in the region of the dorsal extremity of this cleft depression Mr. FAGGE asked for the evidence in favour of this view, which chiefly interested him as it suggested a possibility of occasional absence of the anterior and middle ear, by a failur of such vacuolation occurring. In casual conversation with several members of this Society he gathered that they had regarded absence of the antro-tympanic cavity as developmentally impossible—a view he was not inclined to share He further asked Professor PATERSON if he entirely discarded Gado's views as to the derivation of the incus.

Mr. CHEATLE said that he had never seen a middle ear without an antrum. He alluded to a series of fine cells which were usually present at the eighth month of fœtal life on the inner aspect of the posterior process of the squamo-zygomatic portion where it formed the outer wall of the antrum. These cells remained distinct all through life, and

could be detected from the mastoid cells, which sometimes overlapped them, by their finer character and more horizontal direction.

Dr. HERBERT TILLEY was equally interested in knowing whether it was developmentally possible for a mastoid antrum to be absent in an individual. He had recently operated upon a woman, twenty-nine years of age, for chronic otorrhea, which proved intractable to the ordinary methods carried out per meatum. The bone of the mastoid was extremely hard, and the lateral sinus was close to the posterior meatal wall. The bone was removed to the level of the inner tympanic wall, the remains of the ossicles and the outer attic wall removed, but no antral cavity could be found. Its presence was then sought for by endeavouring to pass fine probes from the region of the attic backwards in the direction of the aditus, but only a small depression was present which would just admit the end of a small probe. Every effort to find an antrum failed, and this not only during the operation but also on two or three subsequent occasions during the after treatment of the case.

He had often met with very small antra about the size of a dried pea, and it was therefore a question whether the size could be still further diminished so as to only admit the point of a probe, in which case it would be almost justifiable to say that no antral cavity existed.

Dr. DUNDAS GRANT drew attention to the frequency with which abnormal patency of the aqueduct of the vestibule was found in congenital deaf-mutes, with a view to eliciting information as to whether there was anything in the development of the temporal bone which might account for it.

The cortical localisation of the auditory area.

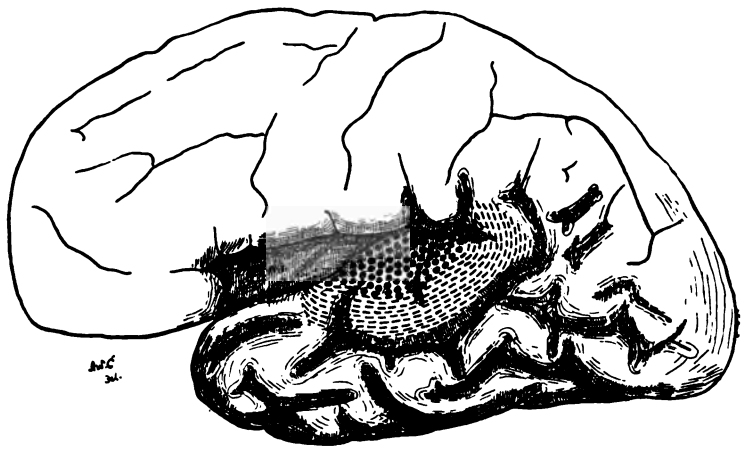
By ALFRED W. CAMPBELL.

"For several years I have been engaged in a systematic examination of the cortex cerebri, in order to ascertain whether the areas which dominate the better-known physio-

logical functions can be proved to possess a distinctive histological structure.

The results hitherto have been encouraging, for both the motor and visual area have been defined with almost perfect accuracy, and it affords me great pleasure to now place before the Otological Society a brief outline of the results of my researches in so far as the auditory centre is concerned. These results have been obtained from an examination in

FIG. 4.



Human Brain. Drawing of left hemisphere with fissure of Sylvius opened out to show the distribution of the audito-sensory area (indicated by dots and its relation to the audito-psychic area (short lines). Note that the audito-sensory area does not extend on to the Insula proper, but is confined to the transverse temporal gyri.

strict serial section of several human and three anthropoid brains; and the amount of labour involved in the research may be gauged from the fact that the examination of one brain occupies at least six months.

To illustrate the method of procedure I may say that if a section taken from the middle of the temporal lobe be stained for nerve fibres or nerve cells and examined, three types of cortical structure may be observed, one special type, characterised by an abundance of large medullated nerve

fibres and large nerve cells, coats the Sylvian side of the superior temporal gyrus; a second special type covers the crown and lower side of the same gyrus, and a third type, which we may call a general one, is found over the remaining convolutions. Now on analysing the distribution of these types of structure in a successive series of sections it becomes possible to define with absolute exactitude two definite areas. The extent of these areas is indicated in the diagrams and casts shown, and I need only say here that one covers the transverse temporal gyri of Heschl and is almost concealed within the Sylvian fissure, while the other occupies the posterior three-fifths of the superior temporal convolution.

It is impossible for me to discuss fully the functions of these areas, but I would mention that the conclusions which I have arrived at, after a careful consideration of most of the anatomical, embryological, experimental and clinico-pathological data which have been adduced on this subject, are that the first area represents the exact limits of the field which we are to regard as the arrival platform for the primary reception of auditory stimuli, while the second represents the extent of cortex which deals with the interpretation and further elaboration of these stimuli. The first, therefore, is a sensory area, while the second has a psychic function.

As to the grounds which can be advanced for this belief; in support of the assumption that area No. 1 is the arrival platform of auditory stimuli, it may be pointed out, firstly, that histologically it possesses an analogous structure to other purely sensory regions, for instance, the visuo-sensory area; secondly, the embryological researches of Flechsig prove that it is the terminus of the central auditory tract, a tract which shows distinct developmental peculiarities; and thirdly, that in all the recorded cases of complete cortical deafness established on an anatomical basis by the results of an autopsy, the bilateral lesions have been centred on this area.

Next, concerning the assumption that area No. 2 has a psychic function; again its structure is analogous to other

psychic areas, and again Flechsig's developmental studies prove that it stands in relation with a distinct set of fibres; further, we know from experimental and clinical investigation that slight lesions of this field give rise to slight degrees of psychic disability, best expressed by the term 'mind deafness,' and lastly we can point to the limitation to this part of the lesion producing the well-known condition 'word deafness.'

These seem to be sufficiently strong reasons for believing that separate sensory and psychic centres exist; and now a word as to the unilaterality of the 'word-hearing' centre. Clinically there is not the smallest doubt that this function is dominated by the left hemisphere, but at the same time reasons exist for thinking that the right hemisphere shares the function, although to a very much less extent, and these reasons are that in none of the many recorded cases of 'word deafness,' resulting from a lesion in the left hemisphere, has the disability been complete, uncomplicated or altogether irrecoverable; and further in all the recorded cases—they are but five—of 'pure and complete word deafness' the lesion has been bilateral. This seems to point to the fact that the right hemisphere shares the special education needed for the interpretation of spoken language, and in accordance with this I would say that my histological researches show no differences between the auditory areas in the two hemispheres. Histology gives no information concerning special centres for the recognition of tones of high and low pitch and of musical sounds.

Some casts and drawings exhibited give an idea of the distribution of these areas, some low-power photographs of sections stained for nerve fibres show the variations in fibre-wealth by which the different areas can be identified, and other drawings show the nerve fibre and nerve cell structure of these parts at a higher magnification; and it may be mentioned that the microscopic drawings have been carefully drawn to scale with a camera lucida, and belong to a large series executed with infinite care by my colleague Dr. A. C. Wilson."

Guides to the surgical relations of the facial nerve, &c., in the temporal bone.

By HUGH E. JONES.

"When one began to do the Stacke-Schwartze operation one was puzzled to know exactly how it was that the facial nerve after leaving the inner wall of the tympanum found its way past the iter ad antrum to a point several millimetres external to the lower border of the membrana tympani. In order to give the nerve a wide berth in my operations I often left an unnecessarily prominent ridge between the meatus and antrum which interfered a good deal with the subsequent dressing of the cavity. I therefore tried to find some simple general guide applicable to all temporal bones and independent of linear measurements. I do not wish to say anything to belittle the value of the linear measurements carried out by many distinguished workers—but I do say that their value lies in determining in the laboratory the relations of structures, and the angles at which various axes and planes in the temporal bone cross one another, rather than in providing a reliable guide for the surgeon at the moment of operating.

One fact in the developmental anatomy of the temporal bone has always appealed to me strongly, viz., that all the very important structures within the bone are confined to its petromastoid portion to the exclusion of the squamo-zygomatic and tympanic portions. There is no anatomical reason why the walls of the attic, 'iter,' antrum, and mastoid cells, so far as they are built up of squama and tympanic bone, should not be removed without injury to the facial canal, the sigmoid groove or the labyrinth.

(The mastoid proper does not enter into the formation of the osseous meatus, so that the facial canal is separated from the lumen of the meatus by the squamous and tympanic bones, and is therefore bound to be at least two or three millimetres behind the surface of the posterior wall of the osseous meatus.)

I have always thought of the squama as the 'operculum' of the attic and antrum.

Though this idea gives one a good general conception of the safe limits of the radical mastoid operation, unfortunately in adults the sutures of the component parts of the temporal bone are so indistinct as to deprive the idea of much of its practical value. One must therefore look for other guides.

I find these guides in the solution of the difficulty mentioned at the commencement of this paper, viz., How is it that the facial canal is internal to the plane of the membrana tympani at its upper part and external to it in its lower half?

The principal plane of the inner wall of the tympanum and 'iter,' and the planes of the tympanic ring and outer attic wall form an angle of about forty-five degrees with the main horizontal axis of the external osseous meatus—that is to say, they slope outwards and upwards from the floor of the tympanum and meatus. The straight portion of the Fallopian canal, on the contrary, starting from the point just below the external semicircular canal, and about the level of the pyramid in the posterior wall of the tympanum, runs downwards and outwards, at an angle of about fifteen degrees from the vertical, to the stylo-mastoid foramen. (FIG. 5.)

It follows that the plane of the Fallopian canal cuts the plane of the tympanic ring somewhere between the level of the short process of the malleus and the umbo.

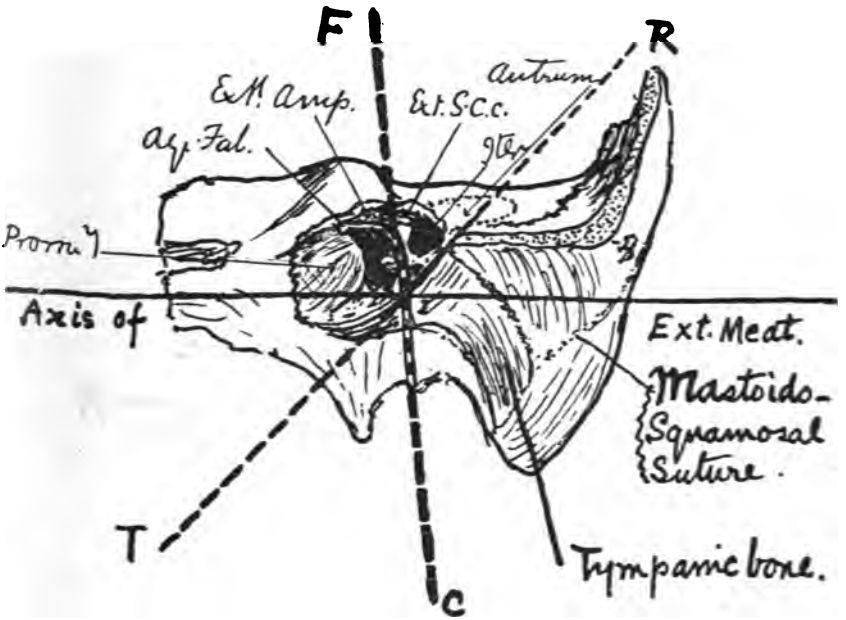
This is true for all the temporal bones I have examined. It gives one the approximate distance of the nerve outwards from the lower margin of the membrane regardless of its distance from the surface of the mastoid or from the external orifice of the osseous meatus.

In the adult bones I have examined the Fallopian canal at the level of the floor of the meatus is in the antero-posterior line drawn through or just internal to the *highest point* of the floor of the osseous meatus—which from this point slopes downwards nearly parallel to the facial canal. (FIG. 6.)

The intersection of the plane of the tympanic ring and the line of the Fallopian canal divides up the posterior walls

of the tympanum and meatus conveniently for description and for teaching the relations of the various structures concerned. If T.R. (in FIG. 5) be the plane of the tympanic ring, F.C., the line of the straight portion of the Fallopian canal, and I. their intersection—the angle T.I.F. will contain

FIG. 5.

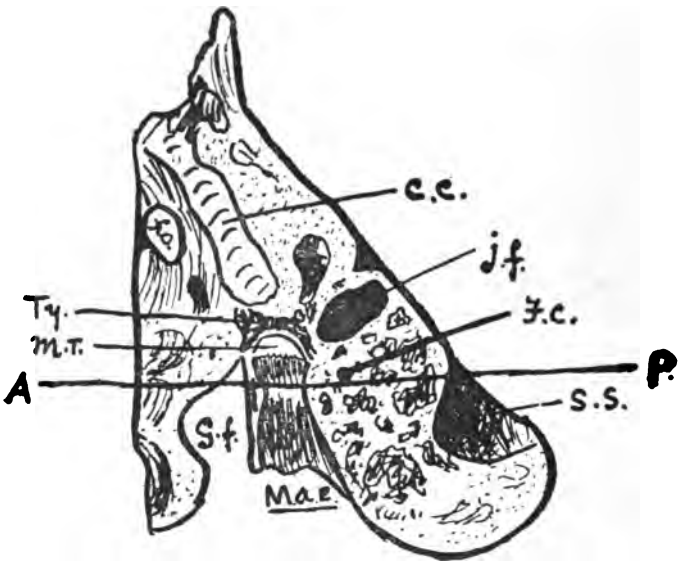


Anterior wall of meatus and tympanum and the roof of the tympanum and "iter" have been removed.

the external ampulla, the curved portion of the Fallopian canal, the fossa ovale and the sinus tympani, the apex of the pyramid and the whole or greater part of the jugular fossa. The angle F.I.R. will contain the external semicircular canal, the 'iter,' and, when present, the opening of the sinus described by Mr. CHEATLE leading into the cells of the squamous bone. If a plane be drawn from the prominence of the external semicircular canal to the highest point of the floor of the meatus

(*i.e.*, parallel with the line F.C.), and parallel antero-posteriorly with the antro-tympanic axis—everything external to it may be freely removed, while everything within it (viz., all the structures enumerated in the angle T.I.F., and in addition the external semicircular canal, the Fallopian canal and the jugular fossa) must be treated with the greatest respect. It

FIG. 6.



Horizontal section of temporal bone just below umbo of malleus. The line A.P. crosses the highest point of the floor of the osseous meatus and just external to the Fallopian canal. F.C.

may be added that this plane at the surface of the bone would correspond in the main with the squamo-mastoid suture and would lie in front of the sigmoid sinus, except in rare cases of very deep grooving.

The practical application of these anatomical facts is as follows:

(1) If we bear in mind this constant relation of the nerve to the tympanic ring we shall not be led to think, in dealing

with bones in which the tympanic bone and the mastoid process are more or less rudimentary, that the facial canal is further in than it really is and shall be independent of measurements from the surface. As Stiles has pointed out, the nerve in young children is exposed to danger at its exit from the stylo-mastoid foramen—even from the knife used for incising the soft parts.

(2) The angle of inclination of the facial canal, the point at which it intersects the plane of the tympanic ring, and the relation of its lower part to the highest point in the curved floor of the external meatus, enable one to tell how much of the posterior wall of the osseous meatus can be safely removed in the Stacke-Schwartze operation.

(3) The outward and backward inclination of the facial canal brings it into relation in its lower half with the petrous and deeper mastoid cells. It therefore behoves one to be careful in scooping out the deeper anterior cells in an acute abscess (such as occurs in influenza). The knowledge of the relation of the nerve posteriorly to the highest point of the meatal floor is also of value when a sinus has formed between the meatus and the mastoid cells.

(4) The proximity of the nerve to the middle part of the tympanic ring and floor of the 'iter' exposes it to danger during the introduction of Stacke's protector, either by reason of the point of the instrument entering the sinus tympani instead of the 'iter,' or by backward pressure on the floor and inner wall of the 'iter.' The lines and angles here given appear to me to give the necessary guides for avoiding this danger.

(5) Finally, the very free removal of the external bony covering of the antrum and tympanum, which these guides permit, should afford a good view of the inner and posterior wall of the tympanum, where, after all, the nerve is most frequently injured, as it crosses the sinus tympani and fossa ovalis in its frail, and often perforated, casing; if the curetting or burring of the tympanum and "iter" is left to the last, the unbroken view of the Fallopian canal, thus obtained, should contribute materially to the safety of the nerve.

Mr. C. A. BALLANCE congratulated Mr. HUGH JONES on the very practical paper he had brought forward. There was no difficulty in dividing the bridge, but hesitation frequently arose about the removal of the posterior wall of the osseous meatus. Mr. HUGH JONES' suggestions would probably aid many surgeons in their work, for the free removal of the posterial wall of the osseous meatus was an essential part of the complete mastoid operation.

Mr. CHEATLE thought that a vulnerable point in the course of the nerve occurred immediately after it left the shelter of the horizontal semicircular canal, and before it entered the thick bone in its perpendicular course. At this point the covering bone was thin, and easily broken through.

Dr. DUNDAS GRANT stated that Professor Schwartze had described variations in the course of the facial nerve, the usual direction being an oblique one, the unusual ones, vertical on the one hand, and horizontal on the other. The last is the form most likely to be injured. Professor Schwartze recommended that the chisel used in removing the spur between the meatus and mastoid cells should be held with the bevelled surface downwards instead of upwards, so that its tendency might be to cut shallower instead of more deeply.

Quinine deafness and its prevention.

By ARTHUR H. CHEATLE.

The older aural surgeons doubted whether quinine produced permanent deafness, but we now fully realise that it does. The cases are usually men who have lived in malarious countries. The effect is due to constantly repeated overdoses of the drug, the overdoses depending to a large extent on the idiosyncrasy of the individual.

In some cases the deafness is slight, and can only be detected by examination; in others it is more marked; while in some it is extreme, and interferes greatly with a man's work and social pleasures.

The lesion is undoubtedly in the perceptive portion, but

the exact site and pathology are unknown. Probably the broad effect is the same as that produced in the eye—namely, anæmia.

The overdose is in some instances due to the doctors; while in others, and to a much greater extent, it is due to the habit which many laymen have of keeping a bottle of quinine, and helping themselves at odd moments. When once deafness due to quinine is established, there is no real remedy. The treatment, therefore, must be purely preventive. Thanks to the grand work of Manson and Ross, the necessity for giving quinine will in time be abolished; but until malaria is stamped out, what preventive steps should be taken?

First, all lay and medical men living in malarious countries should be warned of the danger to hearing produced by quinine, the former being especially warned against its indiscriminate use. Secondly, if quinine has to be given, the dose should be as small as possible, and guarded by hydrobromic acid. As a rule, the acid is not given in sufficiently large doses: a dose of ℥xv. is often seen on prescriptions. The dilute acid may be given up to ʒi. or ʒii. three times a day. Quinine may be given subcutaneously or intra-muscularly, a method which some recent writers say abolishes or greatly diminishes the ear symptoms. Thirdly, I would ask, Is there any other drug which can be used in the place of quinine? I believe arsenic is sometimes used with good effect; and Dr. H. Corke, medical officer to the Zanzibar Government in Pemba, reported in the *Lancet* a case of blackwater fever treated successfully with the liquid extract of Cassia Beareana, the botanical and medicinal properties of which are described by Dr. D. R. O'Sullivan-Beare and Mr. E. M. Holmes in the *Lancet* for February 1, 1902, p. 282.

Dr. THOMAS BARR said: We are much indebted to Mr. CHEATLE for bringing up this very practical and important matter. In common, I should say, with most otologists, I have been impressed with the injurious effects of quinine,

even in medicinal doses, upon the hearing of persons who already suffer from defect. There is, unfortunately, a singular ignorance on the part of many practitioners regarding the mischievous effects of quinine on the hearing of persons who are already partially deaf. The injurious effects of quinine upon persons whose hearing is perfect are usually temporary; but where a defect already exists, the mischief is more apt to be permanent, and the injudicious giving of quinine may convert a hearing defect which still admits of the patient following his employment or profession into one which threatens the loss of his means of living. I am regularly in the habit of warning patients suffering from chronic deafness that, when requiring medical treatment, they should draw the attention of the physician to the hearing defect, so that if quinine be proposed, another medicine, if possible, may be substituted for it. It would be well if the Society would take means to inform the profession at large of the necessity of guarding deaf people against the injurious effects of quinine.

Mr. BALLANCE thought that, after the remarks of Dr. BARR, it would be desirable to bring the question of appointing a committee on quinine deafness before the Council. Mr. CHEATLE'S paper was undoubtedly of public importance.

Dr. DUNDAS GRANT congratulated the Society on the introduction to it by Mr. CHEATLE of a subject of so much interest and importance. There was difference of opinion as to whether the effect produced on the auditory apparatus by quinine was an anæmia or a congestion. The anæmic idea was founded simply on analogy, because it depended on the assumption that the anæmia produced by large doses of quinine in the retina was produced also in the internal ear. There was experimental evidence, on the other hand, that the change produced was a congestion, with actual hæmorrhage into the internal ear, as shown by Kirschner's experiments on guinea-pigs; it had, however, been suggested that the congestion was not the result of the quinine, but of the convulsive disturbance which accompanied death. Dr. DUNDAS GRANT hoped that the question would be submitted to further experimental

investigation, with precautions taken to avoid such mechanical disturbances. He himself believed that the condition really was a congestion, because in several cases he had found that the pulsating tinnitus induced by quinine was checked by compression of the vertebral arteries, as also by the administration of bromides and hydrobromic acid. He had tentatively employed small doses of quinine in cases of nerve deafness which seemed to be due to anæmia, and had found some improvement in hearing follow—a result which seemed to confirm his opinion that the effect of quinine was to produce an increase of vascularity in the internal ear. In a case of autophonia in a neurasthenic subject, the administration of quinine relieved the patient of the distress occasioned by the sound of his own voice. Dr. DUNDAS GRANT admitted that he did not consider the question settled, but thought it would be a work well worthy of the Otological Society.

Dr. MILLIGAN said that he wished to associate himself with the remarks which had been made by Dr. BARR. In his experience, much injury was done to the ear as a result of the indiscriminate prescribing of quinine. He had found that patients who had already suffered from ear disease were much more susceptible to the influence of quinine than those who had had no previous ear trouble. His idea was that quinine produced an anæmic condition of the labyrinthine vessels, and that such an anæmic condition was in some measure, at any rate, relieved by the exhibition of nitrites.

Dr. PERMEWAN thought that the remarks of Dr. DUNDAS GRANT and Dr. MILLIGAN showed the necessity of accurate scientific knowledge of the effect of quinine on the ear. Dr. DUNDAS GRANT was inclined to use quinine in the treatment of anæmic conditions of the internal ear, whereas Dr. MILLIGAN attributed quinine deafness to anæmia, and treated it by nitrites, which tended to produce a temporary hyperæmia. Both views could not be true, and were, in fact, mutually contradictory. In any case, the real importance of the question was in relation to cases of long-continued administration of quinine as a tonic, rather than in the treatment of malaria. Most people would prefer to put up with the effects of quinine

on the ear rather than suffer malarial poisoning; but it was quite otherwise with the use of quinine as a tonic, and that was the point that really required investigation.

A case of acute otitis media and antrum disease (after operation).

By C. G. LEE.

The patient, a man aged forty-five, whose occupation was that of a captain of a ferry steamer, in December 1901 got an acute attack of otitis on the right side. He was admitted into the Liverpool Eye and Ear Infirmary on January 24, 1902, with a temperature of 102·4°. Mr. LEE opened the antrum, which contained pus, and a communication was found with the middle fossa, which led to an extradural abscess. About one drachm of pus was evacuated. The antrum and tympanum were thrown into one cavity. No grafting was attempted, but convalescence was complicated and prolonged by a severe attack of erysipelas, during which the temperature reached 104·8°.

The patient finally left the infirmary in April 1902, and has remained at his work ever since entirely free from pain and discharge.

Two cases of chronic suppurative middle-ear disease.

By WILLIAM MILLIGAN.

The patient, Miss B., *æt.* 27, had suffered for many years from chronic suppurative middle-ear disease. The discharge from the ear was extremely fœtid, and occasionally blood-stained. A large perforation existed in the upper and posterior segment of the membrane, and extensive caries was demonstrable. Attacks of pain and vertigo were frequent, and a radical mastoid operation was advised. The operation was performed in the ordinary way, and eight days afterwards the antro-tympanic cavity was grafted. The special feature of the case consisted in the fact that no antro-meatal dressings were used, the cavity being simply syringed with

sterile salt solution and the ordinary external dressings applied. Gold-leaf was used to keep the graft in position, but no packing was employed. The progress of the case was eminently satisfactory. In five weeks complete healing had taken place. The hearing-power, which before the operation was practically nil upon the affected side, was not altered at all after operation.

Dr. MILLIGAN showed another patient, Mrs. C., *æt.* 30, who had also suffered for many years from chronic suppurative middle-ear disease. The discharge in this case too was fœtid and blood-stained, and deep-seated caries was present. Local treatment had been adopted for over two years, but without any material benefit. A radical mastoid operation was performed; packing the cavity with iodoform gauze was followed out, and within five weeks' time the whole antro-tympanic cavity was lined with epithelium.

These two cases were shown, the one to demonstrate healing by means of grafting, the other healing by gradual epithelialising of the cavity.

Mr. HUGH E. JONES remarked that the grafts in these cases followed very closely the eminences and depressions of the tympanic and antral cavities, differing in this respect from some of the speaker's cases, in which the grafting had for various reasons been delayed for eight or ten weeks. In the latter the depressions were filled by condensed granulation tissue.

The close application of the graft to the various depressions and elevations of the cavity was probably due to the use of the burr, by which the cavity could be more thoroughly stripped of its soft parts, the recesses cleaned out, the whole surface smoothed, and the bed of the membrana tympani destroyed. In his cases the burr was not used; and in some of them the grafting operation had been delayed for six, eight, or ten weeks by suppuration, influenza, and erysipelas during which delay the smaller recesses became filled with organising granulation tissue.

With regard to the question of desquamation in ungrafted

cases as compared with the grafted ones, in one of the latter, which was declared by some of the otologists present to be perfectly sound, the cavity was found three weeks previously, and twelve months after operation, to be lined by a "glove finger" of desquamated epithelium. On removing this a single small granulation was discovered in the tympanic orifice of the Eustachian tube. After the granulation was destroyed the cavity resumed its healthy grafted appearance. The former ungrafted case (which, unfortunately, was not present) returned after two years with precisely the same condition of desquamation; and in this, as in the other case, a single small granulation was discovered, the destruction of which led to complete cessation of desquamation. It was to be inferred from this that there was no essential difference in the behaviour of grafted and ungrafted cases.

Mr. WHITEHEAD asked Dr. MILLIGAN if he had tried the method of leaving the meatus and bony cavity without any packing in other cases, and what the results had been.

Dr. HERBERT TILLEY was interested in the case which Dr. MILLIGAN had shown, and in which he had used no packing of any kind during the after-treatment. For some time past one of the speaker's colleagues at Golden Square Hospital had been in the habit of merely inserting a large drainage-tube through the meatus at the end of the complete operation. The inner end of the tube reached to the tympanic area; the outer was cut off flush with the outer end of the meatus. The posterior skin wound was completely sutured. The drainage-tube was removed every second day, the cavity cleansed with sterilised wool-mops, a few drops of rectified spirits of wine containing boracic acid in solution were dropped in, and the drainage-tube reinserted. Some of these cases had done extremely well. He should imagine that the method would only be suitable for antra of medium size in young patients when the bone was moderately soft, as opposed to the large antra and sclerosed mastoids which are frequently met with in more adult individuals.

Dr. PERMEWAN wanted to know the results of operative procedure in cases of chronic ear disease. As a learner, he

was anxious to ascertain what the effect of these operations really was. He thought the time had gone by for the exhibition of one or two cases with a successful issue, and that the time had arrived for a free and frank statement of the percentage of successes and failures in this operation. His own experience had not been uniformly favourable; he was inclined to attribute that to inexperience, but was anxious to know to what extent success was due to perfection of method, and to what extent to careful and judicious selection of cases.

Mr. RUSHTON PARKER seconded the request of Dr. PERMEWAN, that Mr. C. A. BALLANCE would kindly indicate what proportion of the cases submitted by him to the complete operation reached, and what proportion fell short of, the objects desired. He, for instance, had had two cases in which the conchal flap had slipped from its first attachment, and had apparently stuck to the bony surface, which ordinarily should be covered with grafts. The external ear cavity thus became occluded altogether, but the hearing on that side continued fair, and all chance of further discharge and trouble seemed at an end.

Dr. BARR desired to know from Dr. MILLIGAN and Mr. BALLANCE if, in cases of grafting, there was the tendency to desquamation which was often troublesome in the ordinary operation months or years after the operation. Such desquamation, leading to granulation tissue, pus formation and adherent crusts, is frequently a source of much trouble, and it would be interesting to know if experience has shown that in the cases which are grafted such undesirable consequences do not occur or are less common.

Mr. C. A. BALLANCE thought that Dr. MILLIGAN'S results were beyond criticism. The object and value of grafting could not be overestimated. The method should be adopted with clean mastoid wounds, and was to be carried out in the same manner and for the same purposes as had been long since recognised in general surgery. In all cases in surgery when grafting was employed the time of healing was greatly accelerated. He hoped that the more general employment

of grafting after the radical mastoid operation would lead to still further improvements in technique. Much still remained to be done, and the members of the Society should individually contribute their quota to the advance of surgery.

Dr. MILLIGAN said, in reply to the PRESIDENT'S question, that he did not think the use of the burr had any material influence in determining the character of the granulations one way or the other. He certainly thought that the burr was of advantage in tending to produce a perfectly smooth surface, which in such cases was highly desirable. He laid considerable stress upon the advantage of having the orifice of the external meatus as little altered from the normal as possible. In reply to Mr. WHITEHEAD, he said that in the case shown by him no packing whatever had been used at any time during the treatment of the case. The whole after-treatment consisted in occasional syringing with sterilised salt solution, and applying the ordinary external dressings. Gold-leaf was used to keep the graft in position, but nothing else. He could not answer Dr. PERMEWAN'S question regarding the actual statistics of grafting operations, but his impression was that about 90 per cent. of his cases got well and remained well. In reply to Dr. BARR, his experience was that a certain amount of desquamation was occasionally found. What he had found more frequently, however, was the exfoliation of an almost complete cast of the interior of the antro-tympanic cavity, and this often months after the original operation.

A case of suppuration behind the mastoid and in the posterior fossa associated with ear disease, but without perforation of the membrane.

By WILLIAM PERMEWAN.

N. P., a boy, *æt.* 15, had an attack of influenza followed by acute pain in the right ear. This pain continued for ten days, but was somewhat relieved three days before Dr. PERMEWAN saw the case. When first seen there was a

swelling behind the ear, obviously due to an abscess in that region. The membrana tympani was somewhat reddened, but there was no perforation, and there had been no discharge at any time from the ear. Dr. PERMEWAN made a long incision, opening the abscess freely; the bone was bare over a considerable area, and three-quarters of an inch behind the meatus, and on a level with it, there was an opening almost large enough to admit the little finger, from which pus was exuding. A probe passed carefully through the opening reached the inside of the skull, and could be passed some inches backwards in the posterior fossa. Owing to the acute character of the case Dr. PERMEWAN did not think it advisable to make an extended investigation as to the exact source of the pus which was welling up from the interior of the skull. It may have come from the subdural space, or even from the cerebellum itself. Nor, in view of the free opening in the bone, was it thought wise to make any further opening. A counter-opening was made in the scalp posteriorly, a drainage-tube was inserted, and the wound was dressed in the ordinary way.

The interest of the case was mainly in the fact that an acute infection of the middle ear, and a spreading of that infection through the bone to the posterior fossa of the skull, occurred without any perforation of the membrana tympani. The exact nature of the organism which caused the infection was, unfortunately, not ascertained, but the history of the case suggested influenza as the cause of the condition. Why the inflammatory process spared the membrane is not very explicable, but such an occurrence must be very exceptional.

The subsequent history of the case was favourable. On the day following the operation the temperature rose from 100° to 101·4°, and some râles could be heard in the lungs. These, however, disappeared in three days, the temperature fell to normal, and the patient made a satisfactory recovery.

Mr. BALLANCE related cases of healed tympanum and extending disease in the mastoid, and even to the lateral sinus

and brain, of influenzal origin, which were comparable to the interesting case related by Dr. PERMEWAN.

Mr. WHITEHEAD mentioned a case which had been under his care, in which the symptoms pointed to cerebellar abscess, and the previous history had been of deafness for four months, with occasional ear-ache, but no otorrhœa. In this case the drum was white, and showed no signs of past or present inflammation, and there was no perforation.

Operation was commenced and completed under artificial respiration, natural breathing having ceased suddenly. The posterior mastoid cells were found to be diseased, and a cerebellar abscess was found and evacuated; but natural breathing was not re-established, and death ensued five hours later.

Mr. C. H. FAGGE had seen several cases of acute otitis media and its complications following influenza, and from a mental analysis of these cases—which were, however, too few to allow a definite opinion—he was inclined to think that in such cases the local signs of swelling of the drum and pain in the ear were often so slight as to be misleading; that such otitides were often on cultivation found to be pure pneumococcal infections, and that such infections tended to produce intracranial disease in the posterior rather than the middle fossa, and so sinus thrombosis and cerebellar rather than cerebral abscess; and that spontaneous perforation of the membrane occurred late, and often after intracranial mischief had already been set up. In such cases he recommended early paracentesis. If such views were incorrect, he would be glad to have them corrected by other members.

Sections of malignant growth of the middle ear.

By WILLIAM PERMEWAN.

Dr. PERMEWAN showed two slides of sections of a growth removed from the middle ear of a woman aged fifty-four. The case is described in the 1902 *Transactions* of the Society. The first section was that of a polypoid growth removed by

the snare; it showed a papillomatous condition becoming malignant. The second was a section of growth removed by the radical operation from the interior of the mastoid, and was a typical epithelioma. The interest of the case was in the fact that a polypoid growth had existed, with constant suppuration, for more than twenty years, and that at the end of that time it became malignant. The necessity of early radical treatment could not be better illustrated.

Two specimens and microscopic sections of epithelioma of the pinna.

By E. MALCOLM STOCKDALE.

The first was from a man aged forty-two, and was of the warty variety, the section exhibiting large isolated cell-nests. The second specimen showed an epitheliomatous ulcer surrounded by a raised edge of new growth from a man aged sixty-two, and sections of this consisted of closely-packed downgrowths of cylindrical columns of epithelial cells, with few cell-nests.

He also showed a specimen of cholesteatoma, and a microscopic preparation from this exhibiting squamous-celled epithelium, stained with carbol-fuchsin.

Casts of upper and lower jaw from a case of chronic middle-ear catarrh.

By PHILIP NELSON.

B. Q., a mouth-breather, presented the condition as shown by casts. Extreme V-shape of upper jaw, with high, arched, cleft-like palate. Lower jaw projected one-third of an inch in front of upper, so that no teeth were opposed. The condition was due to adenoid growths, from which she had suffered since infancy. Injury to hearing and facial deformity showed importance of early and thorough removal of adenoids. The casts were kindly made by Mr. L. Osborne.

Mr. WHITEHEAD had made a number of casts of the jaws of similar cases, and thought the appearance of the upper jaw was typical of naso-pharyngeal obstruction; but projection forwards of the lower jaw was very unusual in these cases.

Cases after operation.

By HUGH E. JONES.

(*a*) *Temporo-sphenoidal abscess;* (*b*) *Superficial cerebellar abscess;* (*c*) *Basal meningitis;* (*d*) *Sinus thrombosis;* (*e*) *Extensive destruction of bone in hereditary syphilis and scarlatina;* (*f*) *Cases of the complete post-aural operation with and without grafting;* (*g*) *Specimens* (*pathological and anatomical*).

Mr. HUGH JONES took the chair during the second half of the meeting.

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